

Glen Davis Road Bridge Replacement

REVIEW OF ENVIRONMENTAL FACTORS

Capertee and Glen Davis, NSW

Prepared for Lithgow City Council



Review of Environmental Factors – Glen Davis Road Bridge Replacements

Document Verification

Revision	Author/s	Internal review	Date submitted	Client Review and Approval	
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0.1	Kate Farrell; G Stirling	E Cotterill	21/10/2021	S Quick	26/10/2021
1.0 Final	G Stirling, K Farrell, A Uhrig	E Cotterill	10/12/2021		

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ABBREVIATIONS

Abbreviation	Description
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
BC Act	<i>Biodiversity Conservation Act 2016</i>
DEE	Department of Environment and Energy
DPI	Department of Primary Industries
DPIE	Department of Planning, Industry and Environment
EEC	Endangered Ecological Community
EPA	Environmental Protection Agency
EPBC Act	<i>Environmental Protection and Biodiversity Conservation Act 1999</i>
EPL	Environmental Protection License
FM Act	<i>Fisheries Management Act 1994</i>
GHG	Greenhouse Gas
KTP	Key Threatening Process
LGA	Local Government Agency
LCC	Lithgow City Council
MNES	Matters of National Environmental Significance
NSW	New South Wales
OEH	Office of Environment and Heritage
POEO Act	<i>Protection of the Environment Operations Act 1997</i>
REF	Review of Environmental Factors
TEC	Threatened Ecological Community
TEF	The Environmental Factor
WoNS	Weed of National Significance

EXECUTIVE SUMMARY

This Review of Environmental Factors (REF) has been prepared by The Environmental Factor (TEF), on behalf of Lithgow City Council (LCC or Council). The report presents findings of the investigations undertaken into matters affecting or likely to affect the environment by reason of the proposal to replace three (3) wooden bridges on Glen Davis Road between Capertee and Glen Davis, NSW (hereafter 'the Proposal').

The report assesses matters affecting or likely to affect the environment within the framework of Division 5.1 of Part 5 of the Environmental Planning and Assessment Act 1979 (EP&A Act), and has considered:

- Impacts on Matters of National Environmental Significance (MNES) under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) (refer Section 5.1)
- Matters affecting or likely to affect the environment in accordance with s 5.5 of the EP&A Act and cl 228 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) (refer Sections 3.2.1 and 4)
- Impacts on threatened species in accordance with s 7.8 of the *Biodiversity Conservation Act 2016* (BC Act) and Part 7A Division 12 of the *Fisheries Management Act 1994* (FM Act) (refer Sections 3.2.2, 3.2.3, 3.2.6, 4.7 and Appendix B)

This report identifies where proposed works including safety measures installed, or 'environmental safeguards', could impact the surrounding environment. The study area is located within the locality of Capertee and Glen Davis, with the current bridges located on Glen Davis Road, at the Airly Creek, Coco Creek and Crown Creek crossings.

LCC proposes to replace the existing timber structures with a modern bridge design to be developed to suit the sites. The proposed bridge replacement and associated construction is located on a public road, and therefore traffic control will be required during construction to facilitate the movement of traffic while initial site preparation works are being completed. It will be necessary to completely close the road on at least one (1) occasion for 10-13 weeks while the bridges are demolished, replaced, and then assessed before being reopened to the public. Since Crown Creek crossing has the potential for a diversion road around to the northern side of the bridge, it is expected that road closures will only be required for works at Coco creek crossing. Council has identified a traffic diversion route for the Airly Creek Bridge works. This route travels along an existing road reserve and Council will liaise with Centennial Coal for use of and risk management of this diversion. This diversion is only suitable for light vehicles (under 4.5t gvm and less than 3.5 m clearance).

Council is exempt under the *Water Management Act 2000* (WM Act) for projects approved under Part 5 of the EP&A Act, therefore a Controlled Activity permit for works on Waterfront Land will not be required. However, since some instream works are anticipated as part of demolition and construction of the new bridges, a Part 7 permit under the Fisheries Management Act (FM Act) for 'dredging and reclamation works' in the bed and banks of the river, along with stream diversion for dry works, and the temporary obstruction of fish passage, will be required. Additionally, a portion of the subject site

adjacent to Airly Creek to be impacted by the works is mapped as Crown Land and will require a Crown Land Licence.

The Proposal will result in the clearing of approximately **0.51 ha** of native vegetation, including groundcovers and mature trees restricted to the direct impact footprint of each bridge. Based on desktop assessment, site visit and habitat assessments undertaken, thirty-two (32) threatened species and one (1) TEC were considered as having the potential to be impacted as a result of the proposal, including thirty (30) species listed under the BC Act and seven (7) listed under the EPBC Act. Targeted surveys were completed for *Litoria boorolongensis* and *Mixophyes balbus* across four (4) nights in accordance with the Survey Guidelines for Australia's Threatened Frogs; while the three (3) study areas supported many native frog species and individuals, these threatened species were not recorded onsite. Tests of significance for threatened species were prepared in accordance with Section 1.7 of the EP&A Act and the EPBC Act *Matters of National Environmental Significance – Significant Impact Criteria Guidelines* (DEWHA, 2009). These assessments have concluded that the Proposal is unlikely to have a significant negative effect on the threatened species occurring within the impact footprint. Therefore, Species Impact Statements and / or Referral to the Environment Minister is not required for this project.

A number of Aboriginal heritage items have been identified via desktop investigations as occurring within 500 m of the Airly Creek bridge study area. There are also a number of non-Aboriginal heritage items identified on properties adjacent to the study area, including the 'Galagher Family Cemetery' approximately 1.2 km to the west of the Airly Creek bridge, and a heritage item known as 'Airly' included in the Lithgow Local Environmental Plan 2014 (LEP), located approximately 650 m to the northwest of the Airly Creek bridge. Given the distance of these items from the construction areas, there is no requirement to consult with Heritage NSW prior to project commencement. An Aboriginal Due Diligence (ADD) assessment has been completed on all three (3) bridge subject sites. This report recommends that no further Aboriginal archaeological assessment is required prior to the commencement of works on the site (Appendix C). A traffic diversion at the Airly Creek site contains an Aboriginal Heritage item within the vicinity of the diversion. This diversion has not been assessed herein and it is understood that Council, in collaboration with Centennial Coal (landholders) will appropriately protect and manage this site.

All proposed work would be completed under the guidance of a Construction Environmental Management Plan (CEMP) to manage and minimise potential environmental impacts, particularly ecological impacts, associated with the proposed work. Once operational, the Proposal is not expected to cause any significant adverse environmental or community impacts.

The proposed removal of the existing bridges and construction of the replacement bridges is anticipated to have positive long-term socio-economic benefits, through the provision of increasing road user safety, and reducing annual expenditure on maintenance of the existing timber infrastructure.

The Proposal is required to be assessed under Division 5.1 of Part 5 of the EP&A Act. This REF has examined and considered, to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the Proposal. Given the nature, scale and extent of impacts, and strict implementation of environmental safeguards outlined in this REF, the Proposal is unlikely to have a significant effect on the environment, including threatened species or ecological communities, or their

habitats. As such it is not necessary for further assessment under section 5.7 of the EP&A Act. The Proposal is also unlikely to have a significant impact on any Matters of National Environmental Significance (MNES) or the environment on Commonwealth land for the purposes of the EPBC Act, therefore a referral to the Commonwealth Department of Agriculture, Water and the Environment (DAWE) under the Act is not required.

1 INTRODUCTION

The Environmental Factor (TEF) has been engaged by Lithgow City Council (LCC or Council) to undertake a Review of Environmental Factors (REF) to fully consider the environmental issues relating to the proposed removal of three (3) timber bridges and replacement with modern road bridges along Glen Davis Road between the townships of Capertee and Glen Davis; the bridges are located at the Airly Creek, Coco Creek and Crown Creek crossings, NSW (hereafter 'the Proposal').

The Proposal consists of removing the three (3) narrow timber bridges that are reaching the end of their useful life and replacing them with wider, modern-design structures made of steel and reinforced concrete. This will result in reduced long-term Council expenditure on maintenance, and increased road user safety. Construction of the three (3) bridges will require the closure of sections of Glen Davis Road on at least two (2) separate occasions to accommodate the individual bridge removal and installation of replacement bridges, during which time residents and visitors to the area would be required to detour via Castlereagh Highway and Glen Alice Road through the township of Kandos.

This REF has been completed in accordance with Part 5, Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation); and has been prepared to assess the potential for impacts on environmental values, with particular emphasis on threatened ecological communities, populations and species listed under the *NSW Biodiversity Conservation Act 2016* (BC Act) and Matters of National Environmental Significance (MNES) listed under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

1.1 Project background

The three (3) timber bridges included in the Proposal were constructed in the early 1940s and are approaching the end of their useful life. Extensive maintenance works, including the replacement of structural components was last undertaken in the 1980s and is now required again to maintain a safe standard of operation. Council is currently required to invest approximately \$120,000 per annum into the bridges for general maintenance costs (pers. comm, Lithgow City Council, 2021).

Given Glen Davis Road's designation as a heavy vehicle route with a 100km/hr speed limit, the 5.5m wide, single lane design of the current bridges is considered a safety risk.

The Proposal involves constructing the replacement bridges using reinforced concrete segments, designed to maximise the asset's life, reduce maintenance costs, and meet current Australian engineering standards. Furthermore, road user safety would be increased, with the proposed new bridge design accommodating two lanes of traffic and a pedestrian footpath (increasing the current width of approximately 5.5 m to 8.5 m).

1.2 Project Objectives

The primary goal of the Proposal is to remove and replace the three (3) timber bridges to provide a safe driving route along Glen Davis Road and reduce Council's current annual expenditure on bridge maintenance.

The secondary objectives are to achieve this goal with

- a. minimal impact to native biota and
- b. minimal disruption to local residents and road users.

This will be executed through thorough pre-commencement impact boundary delineation, careful design and construction methodology including pre-clearing surveys, and site inductions for work personnel.

1.3 Site description

The study area is broken up into three (3) individual sections, defined by the creek crossings on Glen Davis Road. The bridges and individual sections are identified as follows (moving west to east from Capertee):

- i) Airly Creek – located approximately 3.8 km northeast along Glen Davis Road from the township of Capertee. Within the road reserve, between crown land Lot 7001 DP 1029380 and Lot 7002 DP 10219380. The Airly Creek bridge subject site is mapped as supporting PCT 0 *Non-native vegetation*.
- ii) Coco Creek – located approximately 16.4 km east along Glen Davis Road from the township of Capertee. Within the road reserve between freehold Lot 1 DP 568768 and Lot 100 DP 1007747. The Coco Creek bridge subject site is also mapped as supporting PCT 0 *Non-native vegetation*.
- iii) Crown Creek – Located approximately 19.6 km east along Glen Davis Road from the township of Capertee. Within the road reserve between freehold Lot 4 DP 249092 and Lot 5 DP 248232. The Crown Creek bridge subject site is mapped as supporting PCT 1304 *White Box – Narrow-leaved Ironbark grassy woodland of the Capertee Valley*.

The vegetation communities present within the study area are mapped as PCT 1330 *Yellow Box – Blakelys Red Gum grassy woodland on the tablelands*, PCT 1876 *Capertee Foothills Box-Stringybark Forest*, PCT 79 *River Red Gum shrub/grass riparian tall woodland or open forest wetland*, PCT 278 *Riparian Blakelys Red Gum – box – shrub – sedge – grass tall open forest*, PCT 1304 *White Box – Narrow-leaved Ironbark grassy woodland*, and PCT 78 *River Red Gum riparian tall woodland / open forest woodland*. The broader locality is dominated by native vegetation with large swathes of cleared agricultural land throughout (Figure 9).

These Plant Community Types are likely to support important habitat for threatened biota, with several threatened species known and/or predicted to occur within proximity to the study area.

Based on the desktop assessment, site visit and habitat assessments undertaken, thirty-two (32) threatened species and one (1) TEC were considered as having the potential to be impacted as a result of the proposal, including thirty (30) species listed under the BC Act and seven (7) listed under the EPBC Act (Section 4.7).

Table 1 Proposal details including location

Road name / Property name Lot, DP	Closest crossroad(s)	Land Zoning	Works location (GDA94/MGA zone 55)
Airly Creek - 3.8km east along Glen Davis Road, road reserve between Lot 7001 DP 1029380, Lot 7002 DP 1029380.	Torbane Road	RU2 – Rural Landscape	780307E, 6330996N
Coco Creek – 16.4 km east along Glen Davis Road, road reserve between Lot 1 DP568768, Lot 1 DP755766, Lot 100 DP1007747	Pinegrove Road	RU1 – Primary Production	790394E, 6329240N
Crown Creek – 19.6km east along Glen Davis Road, road reserve between Lot 5 DP248232, Lot 4 DP249092	Crown Station Road	RU1 – Primary Production	793211E, 6329471N

Table 2 Definitions

Term	Description
Subject site	<p>The area to be directly affected by the Proposal, including earthworks, in-stream works and vegetation clearing. Includes:</p> <ul style="list-style-type: none"> • Airly Creek crossing: 67 m by 25 m area • Coco Creek crossing: 76 m by 25 m area • Crown Creek crossing: 68 m by 38 m area <p>A total area of 0.51 ha (Figure 1).</p>
Study area	<p>Includes the subject site (as described above) and any proximal areas that could be potentially directly or indirectly impacted by the Proposal. For the purposes of this report the study area has included a buffer area of 100 m either side of the centre line of the bridge, measuring a cumulative 14.63 ha of which native vegetation equals 13.44 ha (Figure 1).</p>
Locality	<p>Is the area within 10 km of the subject site (Figure 2).</p>

2 PROPOSAL DESCRIPTION

The Proposal, as assessed herein, consists of removing the three (3) existing timber bridge structures on Glen Davis Road crossing Airly Creek, Coco Creek and Crown Creek, and replacing the crossings with modern bridges constructed of steel and reinforced concrete. All three (3) bridges are located along Glen Davis Road between the townships of Capertee and Glen Davis.

The bridges were constructed during the early 1940s and are approaching the end of their useful life. Extensive maintenance works, including the replacement of structural components was last undertaken in the 1980s and, due to safety concerns, is now required again. Furthermore, Council invests approximately \$120,000 per annum into the bridges in general maintenance costs to maintain them at a safe operating level.

The single lane design of the bridges is considered a safety risk, as Glen Davis Road is a designated heavy vehicle route with a speed limited of 100km/h. The proposed replacement design will widen the bridges to safely accommodate two (2) lanes of traffic and include a pedestrian footpath (from the current 5.5 m to approximately 8.5 m width). The replacement design will also be constructed from prefabricated reinforced concrete segments to maximise the asset's lifespan, make site installation more efficient, reduce ongoing maintenance costs, and meet current engineering standards.

Council has received grant funding from Transport for NSW (TFNSW) to replace the bridges, together with three other Councils. The four Councils have engaged a procurement consultant to approach the market for the design and construction components as a joint-approach. At the time of preparing this REF, the final design and construction methodology for the bridges had not been finalized. Council has advised that final design and methodology is expected to be finalized and ready for review by February 2022.

Construction duration for each bridge is expected to be approximately 10-13 weeks, during which time Glen Davis Road will require closure on at least one (1) occasion to accommodate the individual bridge removal and construction of replacement bridge. During periods of temporary road closure, local residents and visitors to the area would be required to detour via Castlereagh Highway and Glen Alice Road through the township of Kandos. Council is considering the feasibility of installing a temporary bridge diversion around the Crown Creek crossing, which would involve establishing a single lane access road to the northern side of the construction site by placing and compacting fill to form an access road and placing temporary culverts on the creek bed. This diversion road would negate the need to completely close the road during construction works on this bridge.

Detailed design of the replacement bridges is currently underway, and once finalised will include definitive laydown, parking, and stockpile areas. Given the need to close the road during construction for at least two (2) of the bridge demolition / construction sites, and the absence of space on the road shoulders, it is anticipated that parking and stockpile sites will be placed on the existing roadway.

A temporary construction impact footprint around each bridge of 10 m either side of the centre line of the bridge has been nominated to allow for the movement of construction machinery, and alteration to the riverbed up and down stream. This direct impact zone (the subject site) has a 100 m indirect impact area applied (the study area).

The following sections provide further detail on relevant aspects of the Proposal, including design development, options selection and proposed construction and operation activities as they apply to the proposed works. Concept drawings have been included as Appendix A.

2.1 Design principles

The core principle for the design and operation of the Proposal is to provide safe access along Glen Davis Road and reduce Council's current annual expenditure on bridge maintenance. The secondary objectives are to achieve this goal with minimal impact to native biota and with minimal disruption to local residents and road users. This will be executed through thorough pre-commencement impact boundary delineation, and use of prefabricated structures where possible to reduce time required for installation, and to limit the need to work within the waterway.

It is proposed that demolition machinery and auxiliary equipment be used for the removal of the timber bridges. This is likely to involve lifting equipment as well as light construction and demolition equipment. The bridge construction phase would involve piling for the replacement bridge foundations in and / or around the water body with the use of cofferdams and installing the bridge substructure, deck and superstructure by lifting precast materials into place. Heavy machinery would include an excavator with drilling attachments for piling, a crane to lift bridge segments into place, and dump trucks for delivering / removing spoil. The number of personnel on the site will vary depending on the phase of demolition / construction.

At this stage, due to the lack of available land adjacent to the construction sites, it is anticipated that stockpiles and construction amenities as appropriate would be established within precleared areas within the subject site, including on the existing roadway, given the absence of traffic due to the required road closure/s.

2.2 Justification for the proposed works

Council has identified the need to undertake extensive maintenance works on the bridges, including the replacement of structural components due to the ongoing cost of maintaining the current structures in their current state of repair, and due to safety concerns regarding the single-lane style of the bridges which occur on a busy transport road in a 100 km / hr speed limit area:

- The annual general maintenance cost, which incurs an expense of approximately \$120,000 per annum, is deemed a requirement to ensure an adequate level of safety for road users. The replacement of the bridges with new structures which meet modern design requirements will eliminate this ongoing maintenance cost.
- Road user safety has been flagged as a risk given the current single lane design, 100 km/hr speed limit, increased heavy vehicle use and the ongoing deterioration of the now ~80-year-old structures.

Given the current risks and financial maintenance cost of the bridges, Council, in partnership with three (3) other local councils have decided to completely replace all three (3) bridges. The Proposal would improve road user safety by widening the bridge from the current 5.5 m width to 8.5 m, allowing for two (2) lanes of traffic and a pedestrian footpath. The replacement design would also be constructed from prefabricated reinforced concrete segments to maximise the asset's life, allow for efficient installation, reduce ongoing maintenance costs and meet current engineering standards. LCC

has received grant funding from TfNSW to undertake the proposed bridge demolition and construction works.

2.3 Options considered

Several options were considered, including:

- 1) Do nothing
- 2) Undertake extensive maintenance of the existing bridges
- 3) Use the available TfNSW funding to demolish the old wooden bridges and replace with new modern designed crossings.

Council have elected to proceed with Option 3, as this is the only option that satisfies the proposed safety improvements and is the most financially viable option.

Glen Davis Road is an important rural road used by local residents and visitors to the Capertee Valley, Glen Davis village and the Wollemi National Park. Allowing the timber bridges to fall into a state of disrepair is not considered a viable option.

2.4 Environmental Safeguards

Throughout the environmental assessment undertaken in relation to the above Proposal, potential impacts on the environment were identified, in relation to the following environmental 'categories':

- Applicable Acts and legislation
- Soils and Erosion
- Waterways
- Noise and Vibration
- Air Quality and Odour
- Non-Aboriginal Heritage
- Aboriginal Heritage
- Biodiversity
- Traffic and Transport
- Socio-economic Considerations
- Waste and Resource Use
- Visual Amenity
- Climate Change

Environmental Safeguards were then developed to address each of the identified impacts, to ensure that the residual impact upon the environment would not be significant. These Safeguards form part of the Proposal and **must be implemented** as part of delivery of the works (summary of which is provided in Appendix D). With these environmental protection measures, the Proposal does not have the potential to result in significant impacts within the above categories, which would have environmental, social and economic consequences for Council, as the consent authority for these works.

Table 3 Types of works relevant to the Proposal

Types of works	Comments
Site preparation works	<ul style="list-style-type: none"> • Clearing of vegetation. • Preparation of access routes for demolition and construction equipment. • Establishment of layby areas and storage facilities and site office.
Construction of temporary single lane crossing immediately north of existing Crown Creek bridge	<ul style="list-style-type: none"> • Clearing of vegetation • Widening of section through excavation and removal of soil and other material. • Installing culvert at point of creek crossing. • Spreading of gravel and other road base material to stabilize road section.
Demolition and removal of existing bridges	<ul style="list-style-type: none"> • Use of heavy lifting machinery and light demolition equipment to detach deck and dismantle supporting structure. • Stockpiling and removal of old bridge materials from site to disposal location.
Stream bed preparation, cofferdam installation and piling works	<ul style="list-style-type: none"> • Installation of cofferdam structures to divert water flow around footing locations. • Drilling directly into creek bed to allow pouring of concrete footings. • Pouring concrete to establish bridge footings.
Installation of bridge support structure and deck	<ul style="list-style-type: none"> • Use of heavy lifting machinery to lower in steel structure and prefabricated bridge sections. • Bolting sections together. • Installation of bridge deck and pouring of road base to form road surface.
Site rehabilitation and revegetation works	<ul style="list-style-type: none"> • Spreading seed, planting tubestock and hydromulching in disturbed areas where vegetation has been removed. • Monitoring of site to ensure rehabilitation measures are effective and no major erosion or long-term ecological damage occurs as a result of construction works.

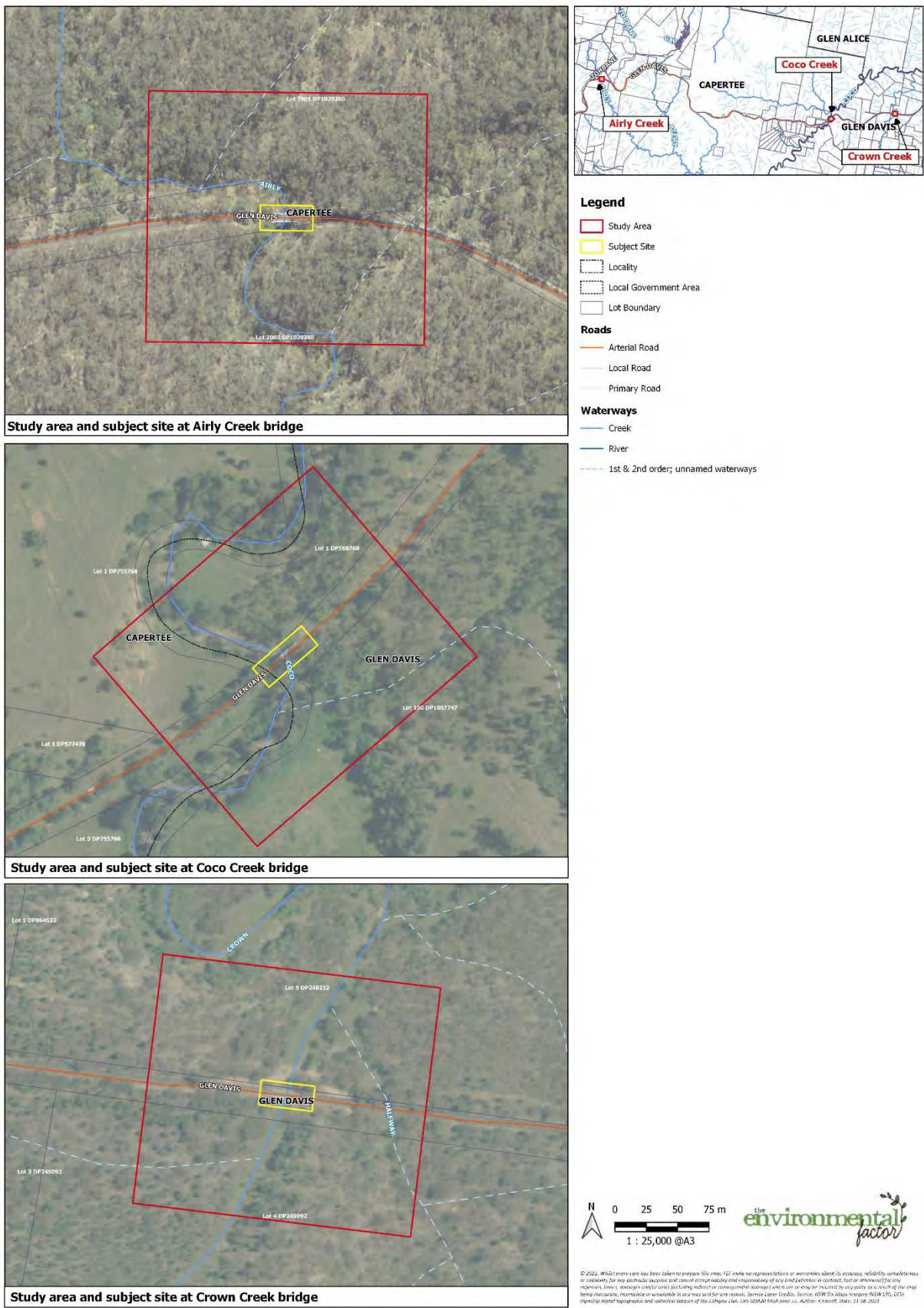
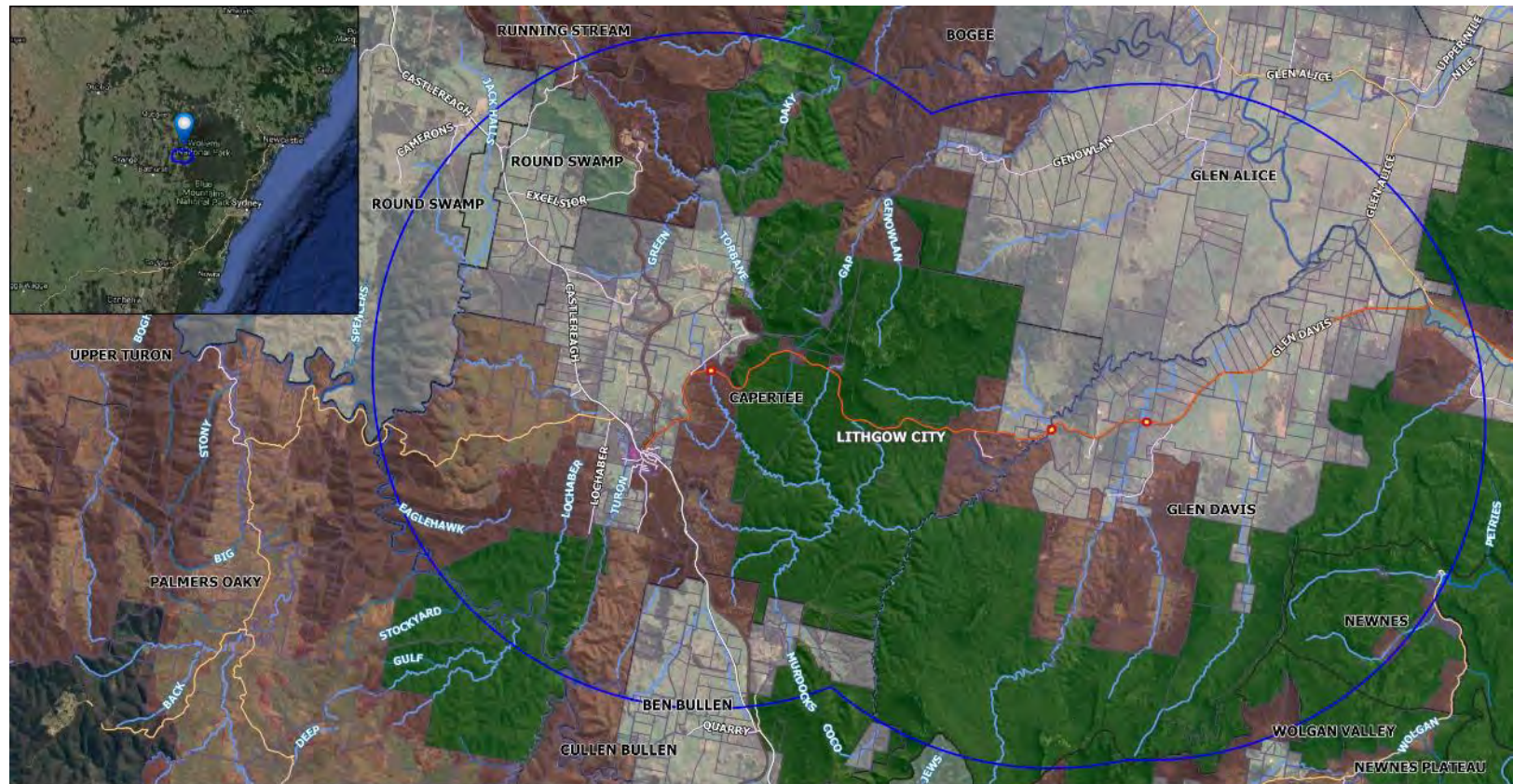


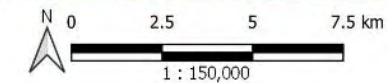
Figure 1 Study area and subject site



LCC Glen Davis Road Bridge Replacements - Regional Context and Land Zoning

Legend

	Roads	Waterways	Land Zoning	



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Figure 2 Regional context and land zoning

3 LEGISLATIVE CONTEXT AND STAKEHOLDER CONSULTATION

The following legislation, policies and guidelines applicable to the REF have been reviewed, and the implications have been assessed accordingly as part of this REF.

3.1 Relevant Commonwealth (Federal) Legislation

3.1.1 *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*

The purpose of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is to ensure that actions likely to cause a significant impact on 'matters of national environmental significance' undergo an assessment and approval process. Under the EPBC Act, an action includes a project, a development, an undertaking, an activity or a series of activities, or an alteration of any of these things (DEWHA 2009). An action that 'has, will have or is likely to have a significant impact on a matter of national environmental significance' is deemed to be a 'controlled action' and may not be undertaken without prior approval from the Australian Government Minister for Sustainability, Environment, Water, Population and Communities (the 'Minister').

The EPBC Act identifies nine (9) Matters of National Environmental Significance (MNES) as follows:

- World Heritage properties
- National Heritage places
- Wetlands of international importance
- Listed threatened species and ecological communities
- Listed migratory species
- Commonwealth marine areas
- The Great Barrier Reef Marine Park
- Nuclear actions (including uranium mining)
- A water resource, in relation to coal seam gas development and large coal mining development.

Potential impacts on relevant MNES must be subject to Tests of Significance pursuant to the EPBC Act Significant Impact Guidelines (DEWHA 2009). If a significant impact is considered likely, a referral under the EPBC Act must be submitted to the Commonwealth Environment Minister.

Significant Impact Criteria Assessments were completed for EPBC Act listed biota considered at risk of impact as part of the proposal (Appendix B). This REF assesses the likelihood of MNES occurring within the locality of the Proposal, and their potential to be impacted by the Proposal (refer Section 4.7). No MNES are likely to be significantly impacted by the Proposal.

3.2 Relevant NSW State Acts of Legislation and Related Policies

3.2.1 *Environmental Planning and Assessment Act 1979 (EP&A Act) and the EP&A Regulation 2000.*

The *Environmental Planning and Assessment Act 1979* (EP&A Act) forms the legal and policy platform for the assessment and approval of works in NSW and aims to ensure that public authorities examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment before they undertake or approve activities that do not require development consent.

All development in NSW is assessed in accordance with the provisions of the EP&A Act and the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation).

The Proposal is being assessed under Division 5.1 of Part 5 of the EP&A Act, as outlined above. In accordance with s 5.5 of the EP&A Act, an REF examines and takes into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the proposal. In considering the likely impact of the Proposal on the environment, the REF must consider the factors set out in cl 228 of the EP&A Regulation.

Section 1.7 of the EP&A Act lists factors that must be considered in the determination of the significance of potential impacts of a proposed activity on threatened species, populations or ecological communities (or their habitats) listed under the BC Act and the FM Act. This Test of Significance is used to assist in the determination of whether a Proposal is 'likely' to impose 'a significant effect' on threatened biota and thus whether a species impact statement (SIS) is required. Section 1.7 of the EP&A Act was addressed as part of the current assessment and tests of significance were completed for relevant threatened species and ecological communities that are likely to be affected by the Proposal. These assessments are included as Appendix B.

This REF has identified that the Proposal is not likely to significantly affect the environment (Section 5); as such, Council will not need to obtain and consider an Environmental Impact Statement before it carries out the Proposal (s 5.7 of the EP&A Act).

3.2.2 Roads Act 1993

The Roads Act regulates the use and management of public roads. Section 138 of the Roads Act requires that consent of the appropriate Roads Authority is obtained for certain work undertaken in, on or over a public road. Under Section 138 of the Roads Act:

(1) A person must not—

- (a) erect a structure or carry out a work in, on or over a public road, or
 - (b) dig up or disturb the surface of a public road, or
 - (c) remove or interfere with a structure, work or tree on a public road, or
 - (d) pump water into a public road from any land adjoining the road, or
 - (e) connect a road (whether public or private) to a classified road,
- otherwise than with the consent of the appropriate roads authority.

(2) A consent may not be given with respect to a classified road except with the concurrence of TfNSW.

Pertaining to the above, Council is the appropriate Roads authority, and will provide the necessary permits to the contractors prior to work commencing, as required.

No TfNSW roads will be impacted as part of this Proposal.

3.2.3 Biodiversity Conservation Act 2016 (BC Act)

Section 7.2 and 7.8 of the *Biodiversity Conservation Act 2016* (BC Act) states that the determining authority must consider the effect of an activity on:

- Areas of Outstanding Biodiversity Value (AOBV), and/or
- Species, populations or ecological communities, or their habitats and whether there is likely to be a 'significant effect' on those species, populations or ecological communities.

The BC Act provides legal status for biota of conservation significance in NSW. It provides a framework for the Biodiversity Assessment Method (BAM) and the calculation of offset requirements for projects participating in the Biodiversity Offset Scheme (BOS).

The BC Act aims to:

- Conserve biological diversity on a bioregional and state scale,
- Lists Areas of Outstanding Biodiversity Value (AOBV),
- Assess the extinction risk of species and ecological communities,
- Identify Key Threatening Processes,
- Slow the rate of biodiversity loss, and
- Conserve threatened species.

Section 4.7 of this REF addresses potential impacts to Biodiversity associated with the proposed works.

3.2.4 Biodiversity Conservation Regulatory Act 2017 (BC Regulatory Act)

The *Biodiversity Conservation Regulation 2017* provides a number of considerations and practices to be implemented as part of the BC Act, as follows:

- Identifies clearing thresholds and the Biodiversity Values Map for the application of the Biodiversity Offsets Scheme (BOS),
- Outlines principles for serious and irreversible impacts (SAIL) to biodiversity,
- Rules for meeting biodiversity offset obligations, and
- Biodiversity certification criteria.

The Proposal is being assessed under Part 5 of the EP&A Act, consequently Council is exempt from compulsory participation and can elect to voluntarily participate in the Biodiversity Offset Scheme (BOS) if desired. LCC have not elected to voluntarily participate in the BOS.

The following list describes the other triggers which may warrant participation in the BOS, additional to the trigger of the assessment pathway:

1. Biodiversity Values Map

The Biodiversity Values Map includes high biodiversity value lands along the riparian corridors of Airly Creek, Coco Creek, and Crown Creek within the study areas of the Proposal, (Figure 12 search date 16/08/2021). However, as Council is assessing the Proposal under Part 5 of the EP&A Act, participation in the BOS is not required.

2. Area Criteria Threshold

Native vegetation clearing thresholds as outlined in Part 7 of the *Biodiversity Conservation Regulation 2017* (Table 4) indicates when a project would need to enter the BOS according to the below minimum lot sizes and the corresponding native clearing thresholds.

Table 4 Area criteria – Biodiversity Offset Scheme threshold

Minimum lot size	Threshold for clearing (ha) to enter BOS
<1 ha	>0.25
1 ha < 40 ha	>0.5
40 ha – 1000 ha	>1
>1000 ha	>2

The clearing thresholds for native vegetation will not be exceeded by this Proposal; therefore, participation in the BOS is not required unless Council voluntarily elects to participate.

3. Areas of Outstanding Biodiversity Value

The presence of listed Areas of Outstanding Biodiversity Value (BC Act) on site would require participation in the BOS. No listed AOBV occur on site.

3.2.5 National Parks and Wildlife Act 1974 (NPW Act)

The NPW Act provides for the statutory protection of Aboriginal cultural heritage places, objects and features. This legislation aims to protect and preserve Aboriginal heritage values.

Part 6 of this Act refers to Aboriginal objects and places and prevents persons from impacting on an Aboriginal place or relic, without consent or a permit. Four (4) Aboriginal heritage items have been identified via desktop investigations as occurring within 500 m of the Airly Creek study area (Figure 8), however none of these sites are within close proximity to the construction area and so will not be impacted by the proposal.

The proposed works will not impact upon any known Aboriginal sites provided the Environmental Safeguards outlined in Section 4.6.4 of this REF and which form part of this Proposal are followed.

Section 4.6 of this REF further addresses potential impacts and assessment undertaken on Aboriginal Heritage associated with the proposed works. A comprehensive Aboriginal Heritage Due Diligence (ADD) assessment has been completed within the proposal study area (Appendix C). While four (4) registered sites are recorded within 500m of Airly Creek site, none of these sites are located within the study area and no newly identified archaeological material was identified during the survey. The ADD assessment recommends that no further Aboriginal archaeological assessment is required prior to the commencement of works on the site.

3.2.6 Heritage Act 1997 (Heritage Act)

The Heritage Act seeks to identify and protect items of cultural heritage value. The Heritage Council of NSW makes decisions about the care and protection of heritage places and items that have been identified as being significant to the people of NSW.

Automatic protection is afforded to ‘relics’ under the Heritage Act, defined as ‘any deposit or material evidence relating to the settlement of the area that comprised New South Wales, not being Aboriginal settlement, and which holds State or Local significance’. Formerly the Act protected any ‘relic’ that was more than 50 years old. Now the age determination has been dropped from the Act and relics are protected according to their heritage significance assessment rather than purely on their age.

Local, and NSW State historic heritage registers were consulted as part of preparation of this REF document (Section 4.5); with one site recorded within 500 m of the Airly Creek study area- Airly (historic homestead on property heritage item ID 1960240 listed on the LCC LEP Instrument no I172) (Figure 8). Given the distance to the actual homestead (approximately 650m), the proposal is unlikely

to impact on this item of heritage, therefore there is no requirement to consult with Heritage NSW or seek any further approvals to complete works.

3.2.7 Fisheries Management Act 1994 (FM Act)

The Fisheries Management Act 1994 (FM Act) aims to conserve threatened species, populations and ecological communities of fish and marine vegetation native to NSW and to promote ecologically sustainable development, including the conservation of biological diversity. It also aims to reduce the threats faced by native fish and marine vegetation in NSW.

Section 220ZZ of the FM Act states that the determining authority must consider the effect of an activity on:

- Areas of Outstanding Biodiversity Value (AOBV) as defined by the BC Act, and
- Species, populations or ecological communities, or their habitats as listed under the FM Act, and whether there is likely to be a 'significant effect' on those species, populations or ecological communities.

If a planned development or activity is likely to have an impact on an aquatic threatened species, population or ecological community this must be taken into account in the development approval process. If the impact is likely to be significant, as determined through an Assessment of Significance test, an SIS must be prepared. The implications of the FM Act have been considered for fish and aquatic species present within all three creeks.

Each of the three (3) waterways considered as part of this Proposal are classified as Key Fish Habitat under the FM Act. If a proposed works are within or adjacent to a waterway that fits the definition of Key Fish Habitat and / or is mapped as Key Fish Habitat, a permit for dredging, reclamation, and / or obstruction of fish passage is required under the FM Act. A permit for dredging work is required under s200 of Part 7 of the FM Act for any work that involves:

- Excavating water land;
- The removal of material from water land that is prescribed by the regulations as being dredging work to which Division 3 of Part 7 applies;
- Using any material (such as sand, soil, silt, gravel, concrete, oyster shells, tyres, timber or rocks) to fill in or reclaim water land;
- Depositing any such material on water land for the purpose of constructing anything over water land (such as a bridge);
- Draining water from water land for the purpose of its reclamation.

'Water land' means land submerged by water:

- (a) whether permanently or intermittently, or
- (b) whether forming an artificial or natural body of water, and includes wetlands and any other land prescribed by the regulations as water land to which Division 3 of Part 7 applies.

Council will need to obtain a 'Part 7 permit' for the Airly Creek, Coco Creek and Crown Creek crossing works, unless the dredging or reclamation work is:

- Carried out by LCC and is carried out in accordance with the Code of Practice for Minor Works in NSW Waterways published on the Department's website: cl 263A *Fisheries Management (General) Regulation 2010*; or
- Authorised under the *Crown Lands Act 1989* (s 200(2)(a)); or
- Authorised by a relevant public authority (other than Council) (s 200(2)(b))

Execution of the Proposal will need to be completed in accordance with any conditions dictated in the Part 7 permit once issued to Council by NSW Department of Primary Industries (DPI).

3.2.8 Water Management Act 2000

The *Water Management Act 2000* (WM Act), administered by the Water division of NSW Department of Industry - Lands and Water, aims to ensure that water resources are conserved and properly managed for sustainable use benefiting both present and future generations. It provides formal means for the protection and enhancement of the environmental qualities of waterways and their in-stream uses as well as to provide for protection of catchment conditions.

Council is exempt from s 91E(1) under the WM Act for projects approved under Part 5 of the EP&A Act, in relation to all controlled activities that it carries out in, on or under waterfront land (cl 41 *Water Management (General) Regulation 2018*). While exempt, it is still recommended that Council be aware of the WM Act and adhere to the associated guidelines.

3.2.9 NSW Guidelines for Controlled Activities on Waterfront Land (NSW DPI 2012)

Any works proposed within the defined riparian zone of a creek are to be carried out in accordance with the WM Act. Works undertaken on waterfront land (i.e. near a river, lake or estuary) require a controlled activity approval under Section 91 of the WM Act, unless defined as exempt. It is anticipated that construction works will occur within the defined riparian zone of all three creeks, however, as above, Councils, as a defined public authority, are exempt from the need to gain a controlled activity approval pursuant to clause 38 of the WM Regulation.

NSW DPI Water guidelines recommend riparian buffer distances to protect and maintain water quality and habitat. Recommended buffer distances are tabled below (Table 5). Works are not to be carried out within the Total Riparian Zone as described below. Development which encroaches within these riparian buffer distances are recommended to be offset using the 'averaging rule' outlined by NSW DPI Water.

Table 5 - Riparian corridors based on stream order (NSW DPI)

Stream order	Vegetated Riparian Zone (each side of watercourse) (m)	Total Riparian Zone (m)
1 st	10	20 + channel width
2 nd	20	40 + channel width
3 rd	30	60 + channel width
4 th	40	80 + channel width

3.2.10 NSW Biosecurity Act 2015 (Biosecurity Act)

The *NSW Biosecurity Act 2015* (Biosecurity Act) outlines mandatory measures that persons are to take with respect to biosecurity matters including the management of weeds (Part 2, Division 8 including Weeds of National Significance (WoNS)). Under the Biosecurity Act, the responsibilities for weed

management by public and private landholders are consistent, reflecting that weed management is a shared community responsibility. The Act introduces the legally enforceable concept of a General Biosecurity Duty (GBD). Priority weeds are listed within Regional Strategic Weed Management Plans, however the GBD is not restricted to listed weeds.

The Biosecurity Act is administered by NSW Department of Primary Industries which determines the weed species covered by regulatory tools including Prohibited Matters, Control Orders and Biosecurity Zones. Existing Local Control Authorities (Councils) continue to be responsible for enforcing weed legislation.

In addition, Lithgow City Council is part of the Upper Macquarie County Council (UMCC), a single purpose local government authority consisting of 4 member councils which acts as the control authority for biosecurity weed threats within the Lithgow LGA. The County Council is responsible for implementing the Business Activity Strategic Plan (2019/2020-2028/2029). The plan outlines priority weeds for the local region and develops a cooperative and coordinated response for the removal and containment of target weed species.

Given the proposal's proximity to previously disturbed roadside vegetation, agricultural land and urban areas, it is anticipated that construction works as part of the proposal have the potential to introduce and spread weed seeds/spores and fungi (e.g. *Phytophthora cinnamomi*). The preparation of a future CEMP will need to outline how the Proposal will adhere to both the Biosecurity Act and the local UMCC strategic weed management plan.

Priority weeds observed on site are described in Section 4.7.

3.2.11 Local Land Services Act 2013 (LLS Act)

The *Local Land Services Act 2013* (LLS Act) includes the management of natural resources in the consideration of the principles of Ecological Sustainable Development (ESD).

Vegetation clearing provisions are considered under Part 5A of the LLS Act. The LLS Act regulates the clearing of native vegetation on all land in NSW mapped as Category 2 – Regulated Land as mapped on the Native Vegetation Regulatory Map. It does not include Excluded Land and Category 1 Exempt Land mapped on the Native Vegetation Regulatory Map.

Vegetation clearing which does not require development consent under the EP&A Act is considered for approval by the Native Vegetation Panel under the LLS Act.

3.2.12 Local Land Services Amendment Act 2016 (LLSA Act)

The *Local Land Services Amendment Act 2016* (LLSA Act), which amended the *Local Land Services Act 2013*, authorised the making of the Land Management (Native Vegetation) Code 2018 (Div 5, Sch 1 of the LLSA Act). The aim of the Code is to authorise clearing of native vegetation on Category 2 regulated land under certain conditions and provide for the establishment and maintenance of set aside areas.

Review of the Native Vegetation Regulatory map (Figure 12) confirmed that the study area occurs primarily on unmapped land with some areas of Vulnerable Regulated Land occurring along all three (3) of the creeks. However, under Division 3, 600 Clearing is authorised under Part 5. Therefore, this has not been considered further within this report.

3.2.13 State Environmental Planning Policy – Infrastructure (ISEPP) 2007

ISEPP aims to facilitate the effective delivery of infrastructure across the State. Including for:

- Section flood mitigation (Division 7, Clause 50)
- Parks and other public reserves (Division 12, Clause 65)
- Roads and road infrastructure facilities (Division 17, Clause 94)
- Sewerage systems (Division 18, Clause 106)
- Soil conservation works (Division 19, Clause 109)
- Stormwater management systems (Division 20, Clause 111)
- Waste or resource management facilities (Division 23, Clause 121)
- Water supply systems (Division 24, Clause 125)
- Waterway or foreshore management activities (Division 25, Clause 129)

Each clause of the SEPP provides for development that is permitted without consent.

As the proposed works are appropriately characterised as development under the ISEPP, the provisions of ISEPP apply. The proposed works can be carried out as activities under Part 5 of the EP&A Act. Development consent from Council is not required:

- Section 129 pertains to development permitted without consent, where development for the purpose of roads and road infrastructure facilities may be carried out by or on behalf of a public authority without consent on any land.
- The Proposal includes removing and replacing the current bridge structures, which form part of the road infrastructure along Glen Davis Rd. A significant component of this reconstruction process would be the construction of a road infrastructure facilities, per Transport for NSW requirements. The Proposal comprises development for the purposes described above, and therefore may be carried out without development consent under Section 129 of the ISEPP and must be assessed as an activity under Division 5.1 of Part 5 of the EP&A Act.
- The Proposal is not located on land reserved under the *National Parks and Wildlife Act 1974* and does not affect land or development regulated by the *Coastal Management Act 2016*, State Environmental Planning Policy (Coastal Management) 2018 (which repealed State Environmental Planning Policy No. 14 – Coastal Wetlands, State Environmental Planning Policy No. 71 – Coastal Protection and State Environmental Planning Policy No. 26 – Littoral Rainforests) or State Environmental Planning Policy (State Significant Precincts) 2005 (formerly known as State Environmental Planning Policy (Major Projects) 2005).

3.2.14 SEPP Koala Habitat Protection 2021

The State Environmental Planning Policy (Koala Habitat Protection) 2021 commenced on 17th of March 2021. The Koala SEPP 2021 reinstates the policy framework of SEPP Koala Habitat Protection 2019 to 83 Local Government Areas (LGA) in NSW. The SEPP 2019 replaced SEPP 44, which was in force from 1995 through to 2019.

The 2021 SEPP largely replicates the provisions which existed under the repealed 2019 SEPP, as it stood when it was in force immediately before its repeal in November 2020. The 2021 SEPP does not apply to land zoned RU1, RU2 or RU3, unless it falls within the nine specified LGAs.

As the study area falls within land mapped as RU2 (Airly Creek) and RU1 (Coco and Crown Creek), the SEPP 2021 does not apply, and the SEPP 2020 holds.

This SEPP does not apply to land dedicated or reserved under the National Parks and Wildlife Act 1974 or to land dedicated under the Forestry Act 2012 as State forest or flora reserve.

Schedule 1 of the Koala Habitat Protection SEPP identifies local government areas (LGAs) to which the SEPP applies. The proposed bridge replacement will occur entirely in the Lithgow LGA which is listed under Schedule 1. The SEPP requires that before granting consent for development on land over 1 hectare in area, a consent authority must be satisfied as to whether or not the land contains 'Potential Koala habitat' or 'Core Koala habitat', as defined below:

- Potential Koala habitat means areas of native vegetation where trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component.
- Core Koala habitat is defined as "an area of land with a resident population of koalas, evidenced by attributes such as breeding females, being females with young, and recent sightings of and historical records of a population".

Where Core Koala habitat occurs, the Koala Habitat Protection SEPP requires that a Koala Plan of Management be prepared.

NB: Generally, the provisions under the Koala SEPP do not apply to activities being assessed under Division 5.1 of Part 5 of the EP&A Act. However, the Koala is listed as a Vulnerable species under the BC Act and EPBC Act, and thus also requires assessment under these Acts. This has been undertaken in Section 4.7, and consideration of the SEPP has been given to assist with assessment of likelihood of impact arising from the Proposal, i.e. whether the area contains 'Potential' or 'Core' Koala habitat as described above.

Koala records occur within a 10 km radius of the study area. Minor occurrences of Schedule 2 feed trees (*Eucalyptus albens*), constituting less than 15 % of the upper or lower stratum of the site, occur within the study areas. No Koalas, or signs of recent habitat use (e.g. scratchings or scats) were observed during the limited onsite survey. Therefore, the site does not meet the criteria of "Potential Koala habitat" or 'Core Koala habitat' as defined under the SEPP.

The Likelihood of Occurrence Assessment (Appendix B) concluded that the risk of impact to this species as a result of the proposed works is Low, therefore a Test of Significance has not been completed for Koala.

3.2.15 Policy and guidelines for fish habitat conservation and management (NSW DPI 2013)

The *Fisheries Management Act 1994* (FM Act) aims to conserve threatened species, populations and ecological communities of fish and marine vegetation native to NSW and to promote ecologically sustainable development, including the conservation of biological diversity. It also aims to reduce the threats faced by native fish and marine vegetation in NSW.

Section 220ZZ of the FM Act states that the determining authority must consider the effect of an activity on:

- Areas of Outstanding Biodiversity Value (AOBV) as defined by the BC Act, and
- Species, populations or ecological communities, or their habitats as listed under the FM Act, and whether there is likely to be a 'significant effect' on those species, populations or ecological communities.

If a planned development or activity is likely to have an impact on an aquatic threatened species, population or ecological community this must be taken into account in the development approval process. If the impact is likely to be significant, as determined through an Assessment of Significance test, an SIS must be prepared. This REF has determined that the Proposal is not likely to have a significant impact on aquatic threatened species, populations or ecological communities.

3.2.16 Protection of the Environment Operations Act 1997 (POEO Act)

The *Protection of the Environment Operations Act 1997* (POEO Act) regulates and requires licensing for environmental protection, including for waste generation and disposal, and for water, air, land and noise pollution.

The objects of this Act are as follows—

- (a) to protect, restore and enhance the quality of the environment in New South Wales, having regard to the need to maintain ecologically sustainable development,
- (b) to provide increased opportunities for public involvement and participation in environment protection,
- (c) to ensure that the community has access to relevant and meaningful information about pollution,
- (d) to reduce risks to human health and prevent the degradation of the environment by the use of mechanisms that promote the following—
 - (i) pollution prevention and cleaner production,
 - (ii) the reduction to harmless levels of the discharge of substances likely to cause harm to the environment,
 - (iia) the elimination of harmful wastes,
 - (iii) the reduction in the use of materials and the re-use, recovery or recycling of materials,
 - (iv) the making of progressive environmental improvements, including the reduction of pollution at source,
 - (v) the monitoring and reporting of environmental quality on a regular basis,
- (e) to rationalise, simplify and strengthen the regulatory framework for environment protection,
- (f) to improve the efficiency of administration of the environment protection legislation,

(g) to assist in the achievement of the objectives of the *Waste Avoidance and Resource Recovery Act 2001*.

The Proposal does not constitute activities that are likely to generate pollution; however, consideration for the prevention of water, air, land and noise pollution is provided herein (refer Sections 4.2, 4.4, 4.1, and 4.3 respectively).

3.3 Community and agency consultation

3.3.1 Stakeholder consultation

Council will consult with any, businesses, government agencies, farming enterprises, landowners and residents with potential to be impacted by the Proposal.

3.3.2 Private landowner consent

It is noted in Section 3.2.1 of this REF that as the proposed works are appropriately characterised as development under the Infrastructure SEPP, the provisions of ISEPP apply. Therefore, the Proposal can be undertaken as an activity under Division 5.1 of Part 5 of the EP&A Act, through provision of this REF and subsequent determination by Council, and does not require further consent.

Given this, there is no requirement to seek consent from private landowners for the acquisition of land; however, the proposal is to be undertaken on land that was previously acquired by Council (Council-owned land).

3.3.3 Mitigation of impacts during construction and operation

The assessment completed within this REF has concluded that socio-economic impacts are expected to be confined to the demolition and construction phase during which closure of sections of Glen Davis Road will be required, bringing disruption to local residents and other road users. All construction works will occur within Council-owned land, with Glen Davis Road providing access for trucks and site traffic.

As noted in the Executive Summary, Section 2 'Proposal Description', Section 6 'Certification' and in the Environmental Safeguards developed for the Proposal (Appendix D), all work will be completed under the guidance of a CEMP to manage and minimise potential environmental impacts associated with the work. Additionally, once operational, the Proposal is not anticipated to result in any significant environmental or community impacts.

Given this conclusion, the likely impacts on surrounding residents are anticipated to be limited to the construction period. The CEMP will list the responsibility of LCC, the Project Management Office (PMO) and the appointed Contractor(s) to develop and distribute notification to local residents before, during and after the construction period. The adequate notification period for residents is fourteen (14) days prior to works commencement.

Table 6 Proposed local resident notifications

Impact/mitigation	Stakeholder	Notifications
Noise, dust	Adjacent rural & residential landowners	<ul style="list-style-type: none"> • Notifications to adjacent landowners; traffic management plans, noise monitoring protocols, working hours • Person to person contact to notify rural landowners of any dust anticipated to settle in adjacent farm dams.
Traffic and access	Local traffic using Glen Davis Rd	<ul style="list-style-type: none"> • Advertisement in local papers (Lithgow Mercury) advising of changed traffic conditions and delivery of construction loads. • Person to person contact to notify residents and other road users who will need to divert via Kandos.
Working hours	Local residents	<ul style="list-style-type: none"> • Letterbox drop of notification listing working hours, and measures to manage local impacts; lighting, truck deliveries and noise onsite

3.3.4 Agency consultation and concurrent requirements

It is understood that Council will be undertaking all stakeholder engagement and community consultation activities internally, as per their community consultation plan.

Section 4 of this REF describes the site-specific environmental impacts and proposed environmental safeguards required to manage any impact during construction to be included in the CEMP.

4 ENVIRONMENTAL ASSESSMENT

This chapter describes the potential key environmental impacts associated with the Proposal during both construction and operation, and the site-specific Environmental Safeguards which are to be implemented as part of the Proposal to ameliorate any potential impacts identified. A summary of the Environmental Safeguards has been provided as Appendix D.

4.1 Soils and Erosion

4.1.1 Existing environment

Both Airly and Coco creeks are narrow waterways with steep embankments surrounded by dense woodland vegetation and rocky outcrops. Crown creek is wider by comparison and conforms more towards a low gradient swampy streamline with sparse upper canopy. Instream works have been completed previously in constructing and upgrading the current bridge structures, including excavation and impacts to surrounding soils from vegetation clearance and construction activities. All three (3) bridges consist of wooden frames set onto concrete pilings that have been sunk into the creek bed. Pile caps have been set on the embankment of Airly creek to support the approach slab; both Coco and Crown creeks have timber wing walls to stabilize the embankment.

Mitchell Landscape Soils

The Airly Creek study area is classified as 'Capertee Plateau' Mitchell Landscape, with Coco and Crown Creek study areas classified as 'Capertee Slopes' (Figure 3).

Capertee Plateau landscape is described as 'Wide valleys, low rolling hills below sandstone cliffs on Permian conglomerates, sandstones, and shales with coal at the base of the Sydney Basin and exposure of underlying Devonian shale, siltstone or quartzite. Small areas of Tertiary basalt. General elevation 800 to 1000m, local relief 100-120m' (NSW Government, 2002).

Capertee slopes landscape is described as 'Steep debris slopes below the Cherry Tree Plateau landscape in Permian lithic sandstones, conglomerate, shale and coal measures extending to the valley floors where steep dipping Devonian quartz sandstone, slate and tuff is exposed. General elevation 500 to 800m, local relief 100m' (NSW Government, 2002).

Acid Sulphate Soils

Bn (p4) acid sulphate soils (ASS) occur on Airly and Crown study areas and Cq (p4) ASS occur on the Coco creek study area. The Proposal involves earthworks being undertaken, with disturbance to in-situ material, with a possible risk of ASS exposure. Specialist soil testing may need to be carried out to determine the types and quantities of these soil types present and their likely effect on the proposed works (Figure 4).

Australian Soil Classification

All three (3) study areas are mapped as Rudosols and Tenosols according to the Australian soils classification (Figure 5). Stratic Rudosols are found where repeated fluvial depositions have occurred without further soil profile development. Tenosols have a weakly developed soil profile which are typically very sandy and without obvious horizons. Tenosols form from highly salicious parent material and where rainfall is from 0 to 1400mm. Generally, tenosols have a very low agricultural potential with

very low chemical fertility, poor structure and low water-holding capacity. Ground-water contamination can be a potential problem due to the high permeability of these soils.

4.1.2 Potential Soils and Erosion Impacts – Construction

Potential impacts to the surrounding environment during the replacement of the bridges include:

- Works will be undertaken within and along Airly, Coco and Crown creeks; consequently there is potential for sediments to enter the waterway during construction works, polluting the waterways downstream, due to earthmoving and erosion.
- Ground disturbance increases the risks of erosion and therefore sediment migration offsite onto roadways and into waterways immediately adjacent. This could result in an impact to water quality, resulting in Pollution of Waters (an offence under s120 POEO Act), if appropriate ERSED controls are not implemented and maintained.
- The compaction of soils, by movement of plant and other heavy vehicles through the site works, leaving surfaces liable to erosion in the longer term.
- Pollution of soils on site, associated with construction wastes and the use of construction materials, fuels, concrete and chemicals.

4.1.3 Potential Soils and Erosion Impacts – Operation

Providing Environmental Safeguards are closely adhered to, and the site is fully stabilised once work is complete, it is unlikely the Proposal will result in long term impacts to soils and erosion.

Table 7 Soils and Erosion impacts summary table

Description	Y	N	Comments
Are there any known occurrences of salinity or acid sulfate soils in the area?	X		Yes, see Figure 4.
Does the Proposal involve the disturbance of large areas (e.g. >2 ha) for earthworks?		X	Vegetation clearing of groundcover and areas of earthworks measured as 0.51 ha.
Does the site have constraints for erosion and sedimentation controls such as steep gradients, narrow corridors or is located on private property?	X		Construction footprint occurs within, and adjacent to steep gradients and waterways.

4.1.4 Environmental Safeguards – Soils and Erosion

The Environmental Safeguards for Soils and Erosion are considered part of the Proposal and must be implemented. Safeguards to be implemented and maintained for Soils and Erosion include:

Construction

- No vegetation outside the approved direct impact footprint is to be harmed or removed; vegetation that is not approved for clearance is to be protected to ensure soils are not exposed or destabilised unnecessarily.
- All areas where groundcovers/vegetation are required to be removed will require careful management during construction due to the higher erosion risks, including Erosion and sediment (ERSED) control measures are to be implemented and maintained to:
 - Prevent sediment moving off-site and sediment laden water entering the Creeks, any drainage lines, drain inlets, or dams and

- Reduce water velocity and capture sediment on site.
- ERSER controls are to be installed prior to the commencement of works and checked and maintained on a regular basis (including clearing of sediment from behind barriers).
- ERSER control measures are not to be removed until the works are complete, and areas are stabilised.
- Monitoring and response actions with regards to ERSER controls will need to be incorporated within the Construction Environmental Management Plan (CEMP) for the Proposal when prepared.
- Any disturbed or excavated areas are to be stabilized as soon as possible using the most appropriate combination of the following measures:
 - Hydromulching with appropriate native grass mixture and/or groundcover species,
 - Turfing with appropriate native grass mixture and/or groundcover species,
 - Seeding with appropriate native grass mixture and/or groundcover species; and/or
 - Revegetation using appropriate native tubestock or mature seedlings.
- Sediment fences/strawbale filters or equivalent should be installed wherever water is predicted to enter/exit the works area.
- The maintenance of established stockpile sites during construction is to be in accordance with the Landcom/Department of Housing Managing Urban Stormwater, Soils and Construction Guidelines (the Blue Book) (Landcom 2004).
- Stockpiles are recommended to be formed in accordance with the Blue Book Standard Drawing 4-1, and offsite/away from waterbodies where possible.
- Topsoil and subsoil are to be separated and protected from degradation, erosion or mixing with fill or waste. Materials are to be reused onsite where appropriate for infilling works, including re-spreading of topsoil as appropriate to enable rapid rehabilitation. Where onsite reuse cannot be accommodated, soil materials should be put to beneficial reuse elsewhere.
- If contaminated soils are encountered during construction, a site assessment is to be completed in accordance with Schedule A 'Recommended general process for assessment of site contamination' (NEPM 1999).
- If contaminated soils are encountered, they will be managed (and if necessary excavated, contained, treated and disposed of) in accordance with the law and relevant EPA and Council guidance.
- All chemical usage and storage during construction is to be in line with legislated requirements, to prevent Pollution of Land, which is prohibited under Section 142 A of the POEO Act.

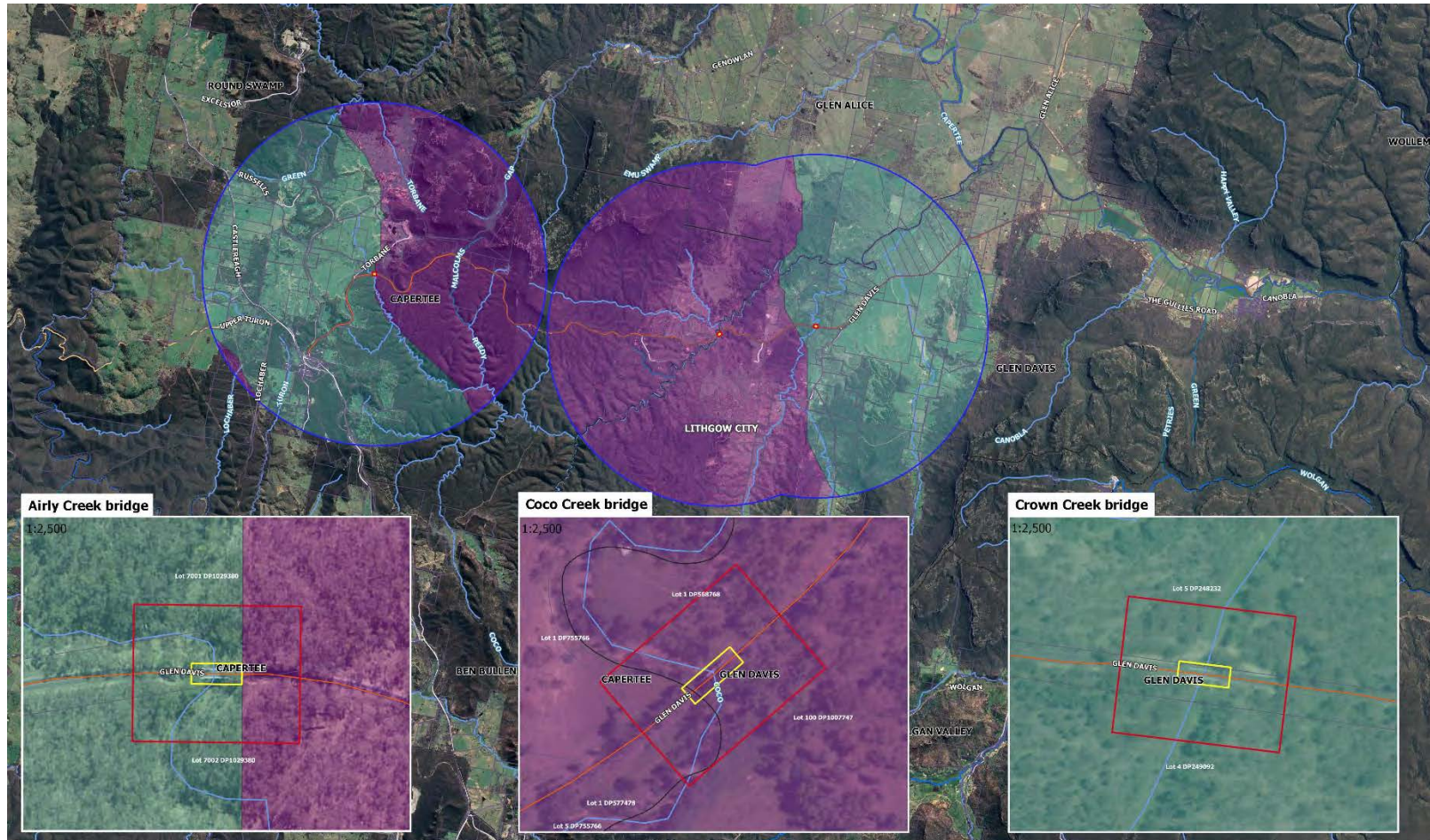
Operation

- Monitoring of the site is to be undertaken to ensure ERSER controls remain in place until the site is re-stabilised, and to ensure no sediment is washed into the waterways following construction and before revegetation / stabilisation efforts are completed.
- Maintenance of vegetative cover on all exposed surfaces (not to be covered by road base/seal or other bridge infrastructure) to be undertaken to ensure the stability of soils on site into the future.

- Infill planting or additional spreading of appropriate native grass mixture and/or groundcover species to be undertaken until the entire site is stabilized.

Impacts associated with Soils and Erosion will not be significant if the above Safeguards are implemented and maintained.





LCC Glen Davis Road Bridge Replacements - Acid Sulphate Soils within 5km of Proposal location

Legend

Study Area 5km Radius Lot Boundary Local Road Waterways 1st & 2nd order, unnamed waterways

Subject Site Locality Roads Primary Road Creek Acid Sulphate Soils

Local Government Area Arterial Road Bn(pH) ASS in inland lakes, waterways, wetlands and riparian zones

Cq(pH) ASS in inland lakes, waterways, wetlands and riparian zones

N 0 2 4 6 km
1 : 100,000 @A3

Figure 4 - Acid Sulphate Soils potential mapped as occurring within 5km of each study area

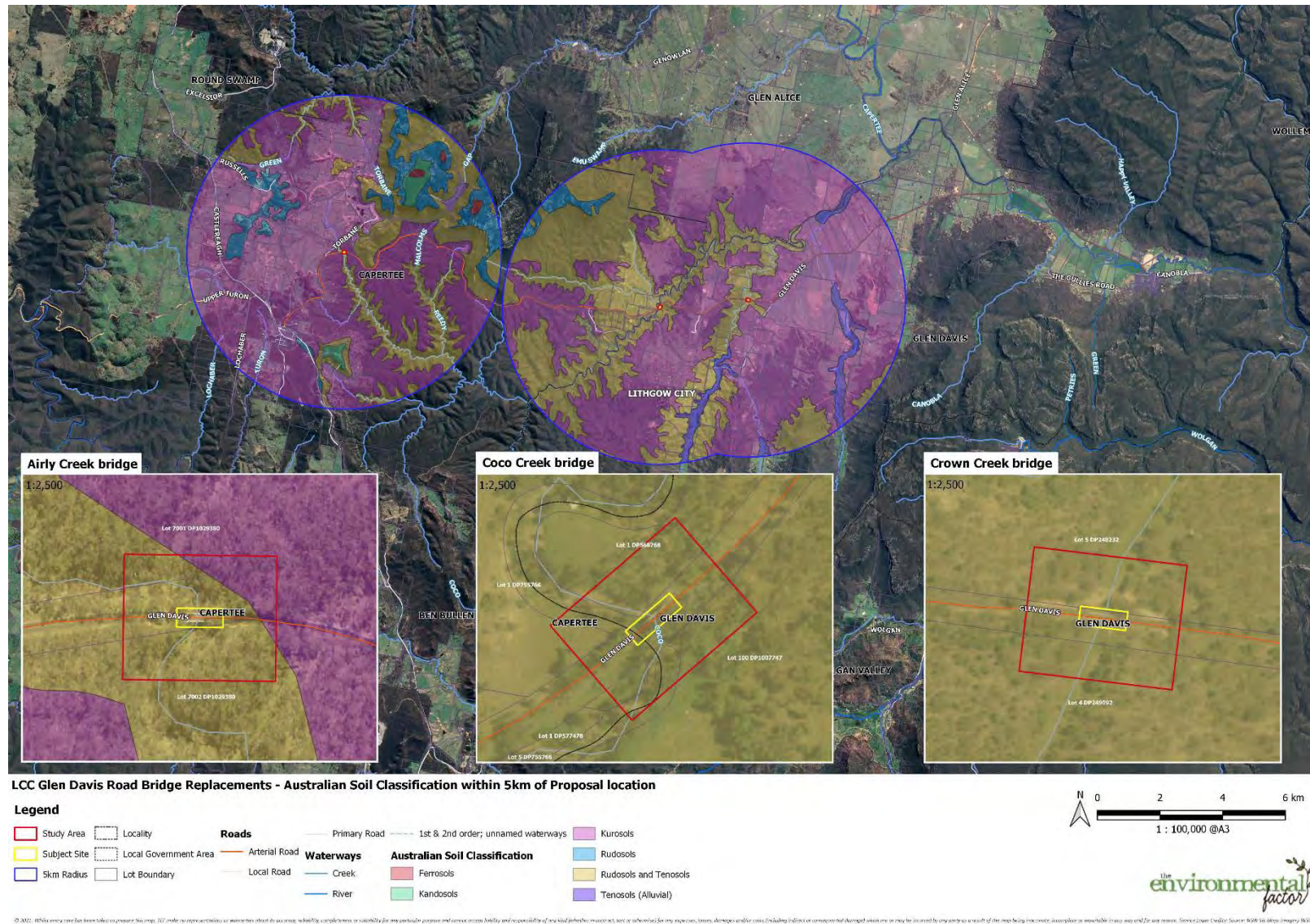


Figure 5 - Australian Soil Classifications within 5km radius of each study area

4.2 Surface and groundwater

4.2.1 Existing environment

The proposed works occur within and adjacent to three (3) named creeks along Glen Davis Road. All are considered locally significant, ecologically important waterways. Both Airly and Crown creeks flow into Coco creek before flowing into the Capertee River approximately 4 km west of the junction of Glen Davis Rd and Glen Alice Road. The Capertee River is a perennial stream that forms part of the Hawkesbury-Nepean Catchment.

Due to no significant rainfall in the days preceding the site assessment, the creeks were experiencing low flows. Airly and Coco Creek study areas are both similar waterway environments, with slow flowing water with rocky pools, washed up logs (snags) and other debris scattered around and directly beneath the bridges (refer Plate 1 and Plate 2). Both creeks are flanked by steep, rocky embankments on either side. Water quality in both creeks was observed as good with low turbidity, although no standardized water quality tests have been completed as part of this assessment. Crown creek differed from the other two – water appeared to flow more slowly due to a gentler gradient through the site. The study area conformed more to a wide swampy stream with dense groundcover and sparse to no canopy cover (Plate 3).

The creeks up and downstream of the subject site supported a variety of aquatic habitats in varying conditions, including trees, rocky outcrops, washed up decaying trees with hollows, rocky pools, snags, stags and swampy grassland.

Waterways which are 3rd order or greater (calculated using the Strahler method 1:25,000 topo) constitute Key Fish Habitat (KFH); all three creeks are calculated to be minimum 3rd order in this location (Figure 6).

Groundwater

The Fisheries NSW Spatial Data Portal (accessed 30/07/2021) shows the vulnerability of aquifers to contamination relating to characteristics such as soil type and water table depth. The study area is recorded as containing shallow ground water resources that could be sensitive to drilling and easily contaminated (Figure 6).



Plate 1 Deep rocky pools and steep banks at the Airly Creek bridge



Plate 2 Rocky cobbles, snags and defined streambed with steep banks at Coco Creek



Plate 3 Flatter, more swamp-like streambed at Crown Creek

4.2.2 Potential Surface and Groundwater Impacts – Construction

Due to the proposed in-stream works involving cofferdam construction and piling, as well as work adjacent to the creeks, careful management is required to ensure that the waterway is not negatively impacted during the construction phase of the project.

There is risk of impact to waterways resulting from the proposed works, as the creeks drain into a major catchment area (Figure 6).

Potential impacts to waterways that may arise due to the Proposal include:

- Potential for spills of fuels and other contaminants during construction which could enter runoff exiting the site and end up in waterways.
- Any drilling or piling works with the use of cofferdams would need to take into consideration the identified groundwater vulnerability of the site.
- Release of sediment into waterways from vegetation clearing, movement of machinery and instream works.

Construction techniques must adhere to the Safeguards outlined in Section 4.2.4.

Nearby surface waters and dams outside the creek areas are anticipated to remain unaffected due to the relatively minor scale of earthworks provided that the Safeguards outlined in Section 4.2.4 are adhered to.

4.2.3 Potential Surface and Groundwater Impacts – Operation

If appropriate site remediation, ERSed measures and best practice design principles that form part of this Proposal are adhered to, impacts to surface and groundwater from the operation of the proposed bridges are not anticipated to be significant.

Table 8 Waterways impacts summary table

Description	Y	N	Comments
Are the works located within or adjacent to a waterbody or wetland? Waters are defined under <i>Protection of the Environment Operations Act 1997</i> and water land and wetlands under section 198A of the <i>Fisheries Management Act 1994</i> and include rivers, streams, lakes, lagoons and constructed waterways, and dams.	X		The Proposal is within and adjacent to three waterways- Airly Creek, Coco Creek and Crown Creek.
Is a Fisheries Permit required? Part 7 Fisheries Permits are automatically required for any third order (or higher) stream under the <i>Fisheries Management Act 1994</i> (FM Act).	X		All three creeks are identified as higher than a 3 rd order stream and works on the creek beds are anticipated.
Will the proposed works be undertaken on a bridge?	X		Demolition and replacement of three bridges
Are the works likely to require the extraction of water from a local water source (not mains)?	X		TBC by final bridge design and construction methodology. Drilling work on creek beds has potential to require water.
Is the site identified as High or Moderate Groundwater Vulnerability?		X	Refer Figure 6
Are the proposed works likely to have an effect on the surrounding water quality? This can include sediment migration, dust, and potential risks of fuel or chemical spills, to both surface and ground waters.	X		It is anticipated the in-stream works during the construction phase will temporarily have an effect on the surrounding water quality.

4.2.4 Environmental Safeguards – Surface and groundwater

The Environmental Safeguards for Surface and Groundwater are considered part of the Proposal and must be implemented. Safeguards to be implemented and maintained for Waterways include:

Construction

- If 'dirty' site water is collected from within the direct impact footprint, it is to be redirected to filtration devices to trap sediments and other pollutants, and dissipate flow velocities, prior to discharging to the surrounding environment. Drainage and runoff should be controlled in such a way that no foreign substrates or materials leave the site.
- 'Clean' water from outside the study area is to be diverted around the site, to avoid contamination and to prevent scour/erosion of the site (particularly the embankments at each crossing) during rainfall events during construction.
- Works to be completed in dry times (i.e. times of no current or predicted rainfall).
- Appropriate sediment and erosion controls are to be installed and maintained during construction, to ensure sediment and pollutant laden surface water runoff does not enter adjacent waterways/drainage lines.
- Any water intersected or used during the drilling/piling procedure is to be captured in an appropriately lined sump and disposed of appropriately off site.

- All litter, including cigarette butts and food wrappers, is to be collected in a suitable receptacle and disposed of appropriately throughout the construction phase to ensure these do not end up polluting waters.
- Re-fuelling of plant and equipment is to occur offsite, or in impervious bunded areas located a minimum of 40 metres from the Creeks, any drains, drainage lines or dams.
- Vehicle wash-down and/or cement truck washout (if required) is to occur offsite unless it forms part of sediment control, where it is to occur in a suitably bunded area.
- Monitoring of water quality is to be undertaken downstream of the construction sites during and immediately following rainfall events, to identify if ERSSED controls are functioning as intended. Visual inspections should be undertaken by an appropriately qualified person/s to determine if water is turbid, or if there is evidence of petrochemicals or other pollutants present as a consequence of construction activities.
- Segregate and stockpile topsoil removed from the area a minimum of 40 m from any waterway and on a flat, stable area. Use measures such as silt fences and holding ponds to prevent stockpile runoff from entering waterways.
- Minimize the length of time that soils are exposed by stabilising as soon as practical by seeding, spreading mulch or installing erosion control blanket as appropriate.
- Biosecurity and water health protection measures should be implemented throughout the construction phase, including:
 - Machinery should arrive on site in a clean, washed condition, free of fluid leaks, pests and/or weeds/spores.
 - Regular weed control should be undertaken in disturbed areas throughout the construction period to prevent weed spread into waterways, if notifiable/listed weed material is present.
 - Ensure all pesticide/herbicides used are registered for use within a waterway, as per NSW DPI guidelines. Alternatively, opt to remove weeds mechanically where possible.
- Spill response protocols for plant, equipment and chemicals used or stored on site during construction are to be available and accessible at all times to prevent and minimise potential for Pollution of Waters (s120 POEO Act).
- A Soil and Water Management Plan will be developed as part of the CEMP for the Proposal, detailing:
 - Water quality parameters to be adhered to throughout construction
 - Appropriate monitoring locations and frequency
 - Location and types of ERSSED controls
 - Proposed revegetation and stabilisation measures to be undertaken

Operation

- Continue to undertake a water quality and quantity monitoring program in line with Council's requirements until all sites are completely stabilised; monitoring should include details of proposed baseline and downstream water quality following any heavy rainfall.
- Subject site rehabilitation, including removal of weeds and revegetation using appropriate native species, to be undertaken to ensure soil stability and prevention of sediment runoff from the site into the future. Revegetation must be maintained with a survival rate of >80%.

Impacts associated with Waterways will not be significant if the above Safeguards are implemented and maintained.

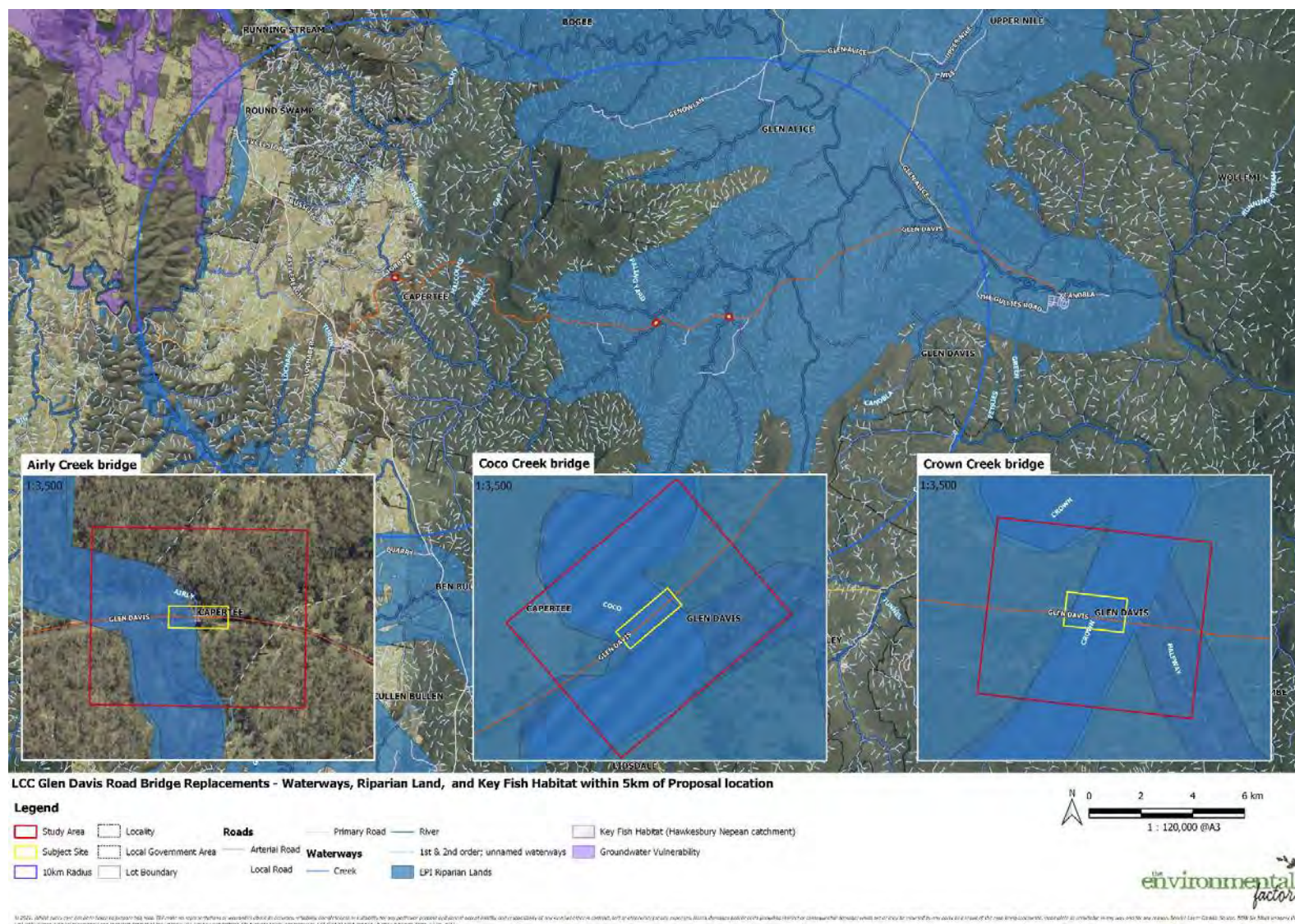


Figure 6 Waterways, Riparian Land, Key Fish Habitat and Groundwater Vulnerability mapped within 10 km of the Proposal locations

4.3 Noise and Vibration

4.3.1 Existing environment

Glen Davis Road, and the creek crossing locations occur, in a mixed rural area and natural bushland setting, with background noise levels typically arising from farming machinery and activities, local traffic, anthropogenic noises, livestock, wildlife and inclement meteorological conditions (rain and wind).

There are a number of properties with access from Glen Davis road, however no residential properties have been identified within 500m of any of the study areas (Figure 7) that are likely to be impacted by the Proposal. The study areas and locality fall within RU1 – Primary Production, RU2 – Rural Landscape and Crown land zoning (Figure 2).

Cars, small trucks and heavy vehicles travelling between 50-100km/hr along Glen Davis Road were observed to cause the main noise disturbance on site, as noted during the September 2021 site visit; however, noise observations made were anecdotal only, as no noise recording devices were deployed.

4.3.2 Potential Noise and Vibration Impacts – Construction

Noise impacts during construction are anticipated to arise from increased heavy vehicle and plant movements; excavators, the drill rig and other mechanical equipment including general engine noise and reverse alert beepers, which are expected as part of the construction phase. There are no residential properties or permanent dwellings within 500m of any of the study areas, and, due to the rural location of the site and lack of further nearby private residences, these noise impacts are considered unlikely to cause much disruption or constitute intrusive noise within the surrounding community.

Noise and vibration generated during construction does have the potential to impact on native fauna, particularly nesting birds, small mammals and frog species. This is further discussed in Section 4.7).

4.3.3 Potential Noise and Vibration Impacts – Operation

The Proposal is not anticipated to generate any noise or vibration during the operational phase additional to the current vehicular noise generated by use of Glen Davis Road including the use of the current bridges.

Table 9 Noise and Vibration impacts summary table

Description	Y	N	Comments
Are there any noise sensitive areas near the location of the proposed works? i.e. < 500m at nearest point, that may be affected by the works e.g. church, school, hospital, residences		X	No residential properties or other sensitive receivers are located within 500m of the proposal locations (Figure 8).
Are the proposed works going to be undertaken during standard working hours detailed below? Monday – Friday: 7:30am to 6:00pm Saturday: 8:00am to 1:00pm	X		Proposed construction hours are as follows: <ul style="list-style-type: none"> Normal construction Monday to Friday: 7 am – 6pm Saturday: 8 am – 1 pm

Description	Y	N	Comments
Sunday and Public Holidays: No work			
Is any explosive blasting required for the proposed works?			TBC by final bridge design and construction methodology. Unlikely.
Is there potential for ongoing operational noise to be generated post completion of works?		X	The proposed bridges will not generate any operational noise.

4.3.4 Environmental Safeguards – Noise and Vibration

The following Safeguards for Noise and Vibration are part of the Proposal and must be implemented and maintained. Safeguards to be implemented and maintained for Noise and Vibration include:

Construction

- Noise emissions should be considered and managed in accordance of the Interim Construction Noise Guideline (ICNG) (Department of Energy and Climate Change (DECC) 2009).
- Noise impacts to the local community will be limited to recommended standard working hours as detailed in the Interim Construction Noise Guideline 2009 (ICNG). All activities and project works, including the arrival and departure of vehicles delivering or removing materials to or from the site, shall be carried out between the hours of:
7:00am to 6:00pm Monday to Friday,
8:00am to 1:00pm Saturdays, and
No work Sunday and Public Holidays
- Residents that have the potential to be impacted by noise and vibration generated as part of works should be notified of the proposed construction no less than two (2) weeks prior to works commencing.
- Communication of intentions and timeframes to neighbouring properties will minimise misconceptions, uncertainty and negative reactions to noise. The site supervisor should supply a contact number to aid in community liaison.
- All noise and vibration complaints are to be handled in a timely manner.
- The appointed contractor will incorporate Noise and Vibration Management strategies in the CEMP, and suitably induct all staff operating machinery on the site to ensure the standard working hours are adhered to, and that machinery movement (revving, reverse beepers) is kept to a minimum. This management plan must include the general noise and vibration management practices (AS 2436-2010).
- Plant deliveries and site access will occur quietly and efficiently, with parking allowed only within designated areas located away from nearby sensitive receivers.
- Simultaneous operation of high-level noise generating machinery should be avoided by operating at contrasting times or increasing the distance between the plant and the nearest identified receiver.
- High noise generating activities, such as jack hammering, should be carried out in continuous blocks, not exceeding three (3) hours with a minimum respite period between blocks of one (1) hour.

- Low-pitch tonal beepers should be installed where possible and reversing minimised on site.
- All engine covers are to be closed and machines that are not in use, shut down.
- Where possible, high noise generating activities such as loading and unloading and material dumps should be located as far as possible from the nearest receptors, except by prior arrangement.
- Works should be timed to avoid prime breeding season (Spring) for the majority of native species residing in the area which may be sensitive to noise and vibration during breeding and fledging.

Operation

No further Safeguards were considered necessary for the operational phase of the Proposal. Operation of bridges following installation is not likely to result in any additional ongoing noise impacts.

Impacts associated with Noise and Vibration will not be significant if the above Safeguards are implemented and maintained.



LCC Glen Davis Road Bridge Replacements - Sensitive receivers within 500m of proposal location

Legend

Study Area	Local Government Area	Waterways	Arterial Road	Lot Ownership	Crown	NPWS Reserve
Subject Site	Lot Boundary	Creek	Local Road	Freehold		
500m Radius		River	Track-Vehicular			
Locality		1st & 2nd order; unnamed waterways				

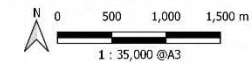


Figure 7 - Sensitive receivers within 500m of the study areas

4.4 Air Quality

4.4.1 Existing environment

Long- and short-term meteorological data for the surrounding area is available from the Bureau of Meteorology (BoM) operated Automatic Weather Station (AWS) at Glen Davis (The Gullies- now closed) and Lithgow (Cooerwull). The Lithgow (Cooerwull) AWS is located approximately 40 km south of Glen Davis Rd and records observations of a range of meteorological data including temperature, humidity and rainfall, wind speed and wind direction.

Temperature data recorded at the Glen Davis AWS indicates that January is the hottest month of the year, with a mean daily maximum temperature of 30.3°C. July is the coolest month with a mean daily maximum temperature of 15.4°C. February is the wettest month with an average rainfall of 72.7 mm falling over almost 6.2 days. According to long-term records, there are on average 61 rain days per year, with a mean annual rainfall of approximately 645 mm. Glen Davis experiences a moisture deficit, with evaporation exceeding rainfall for all months, excluding June and July. The increased moisture deficit of the hotter months increases the dust erosion potentials of exposed areas and therefore has important implications for fugitive dust control during the construction phase.

Weather conditions in Glen Davis on the 2nd of September were warm and dry with a minimum of 0 degrees and a maximum of 24 degrees. No Rain was recorded at the Lithgow weather station, nor was rain observed during the site visit (Table 10).

Table 10 Weather conditions preceding, during and following field surveys (weather station: 063226)

Date	Temperature (°C)		Rain (mm)	9am Wind Speed	
	Minimum	Maximum		Speed km/hr	Direction
28/08/2021	1.9	11.9	0	11	SW
29/08/2021	-2.5	13.2	0.1	4	SE
30/08/2021	1.5	17.3	1.2	7	SSW
31/08/2021	-2.0	17.4	0.1	0	N/A
01/09/2021	-0.6	19.9	0.1	0	N/A
02/09/2021	0	24	0	6	NE
03/09/2021	5.4	19.9	0.2	13	NNW
04/09/2021	9.7	13.4	0	13	NNW
05/09/2021	5.0	8.6	12.2	7	W
06/09/2021	3.8	12.8	0.4	11	SW
07/09/2021	-1.9	15.0	0	11	SW

Glen Davis, Capertee and the surrounding area generally enjoy clean air; a lack of heavy industry and a low concentration of vehicles ensures that pollutant levels are relatively low. The primary air pollution emissions sources that contribute to existing ambient air quality levels in the area include:

- Wind generated dust from exposed areas within the locality
- Dust emissions from agricultural activities
- Dust entrainment due to vehicle movements along unsealed and sealed rural roads with high silt loadings
- Diesel and petrol fuel combustion emissions from road and non-road sources

- Seasonal emissions from household wood burning
- Episodic emissions from dust storms and vegetation fires (local and regional).

4.4.2 Potential Air Quality Impacts – Construction

Potential impacts to air quality may arise from airborne dust particles generated during earthworks, stockpiling and managing topsoil, transport and handling of soils and equipment and the use of construction vehicles and the drill rig emitting dust and exhaust fumes. The extent of air pollution generated during construction depends on a number of factors, including the type of machinery used, construction techniques, weather conditions and the cumulative effect of other construction activities in the near vicinity (e.g., agricultural activities such as ploughing, and any hazard reduction burns).

The impacts are anticipated to be of short duration and minor in nature and are not expected to have a large or prolonged impact on air quality in the area.

4.4.3 Potential Air Quality Impacts – Operation

Following the stabilisation of disturbed ground, the Proposal is not anticipated to have an impact on air quality in the area during the operational phase.

Table 11 Air Quality impacts summary table

Description	Y	N	Comments
Are the proposed works likely to result in large areas (>2ha) of exposed soils?		X	The total direct impact area across the 3 sites is 0.51 ha . In addition, all areas of exposed soil will be rehabilitated after construction works through revegetation.
Are there any dust sensitive receivers located within the vicinity of the proposed works (<500m away at nearest point) during the construction period (i.e. church, school, hospital, residences)?		X	All 3 construction sites are in remote areas. While there are privately owned blocks of land adjacent to the 3 bridges, there are no occupied homesteads within 500m of the proposed work sites.
Is there likely to be an emission to air of dust, smoke, steam or vehicle emissions?	X		Yes, though minimal; the study area and locality contain fine, friable soils likely to result in dust emissions once disturbed. Safeguards should effectively ameliorate any emissions if correctly adhered to. Vehicle emissions will be released from operation of construction vehicles and drill rig.

4.4.4 Environmental Safeguards – Air Quality

The following Safeguards for Air Quality are part of the Proposal and must be implemented. Safeguards to be implemented and maintained for Air Quality are as follows:

Construction

- Council must undertake community engagement and liaison, to set expectations for the works schedule and likely impacts arising as part of the works, particularly prior to works commencing.
- Daily visual construction dust monitoring should occur, with works to cease if dust plumes are occurring that have potential to impact areas outside the direct impact footprint.

- Drivers must adhere to speed limits on access tracks, the proposed diversion route across Crown Creek and across the sites in general during dry weather to keep dust to a minimum.
- Provide an adequate water supply on the construction site for effective dust/particulate matter suppression/mitigation. If synthetic dust suppressants are used, they must be biodegradable in nature and non-toxic for waterways.
- Earthworks and exposed areas/soil stockpiles are to be revegetated using appropriate native/crop species to stabilise surfaces as soon as practicable.
- Only vegetation that has been approved for removal may be removed or otherwise impacted; intact vegetation stabilises soils and keeps dust to a minimum.
- Vegetation and other materials are not to be burnt on site, unless the vegetation material is a weed that prohibits transportation and disposal by other means.
- Vehicles transporting waste or other materials that may produce odours or dust are to be covered during transit.
- Tracking of machinery carrying soil/spoil through Capertee or Glen Davis is to be avoided where possible.
- Stockpiles or areas that may generate dust are to be managed to suppress dust emissions.
- Dampening of exposed soils will be undertaken during weather conditions conducive to visible dust formation.
- Construction plant and equipment will be maintained in a good working condition in order to limit impacts on air quality through vehicle emissions.
- Fuel operated plant and equipment will not be left idle when not in use.
- Regular site inspections will be undertaken as part of air quality monitoring, and inspection results recorded by Council's Principal Contractor.
- Any dust complaints received during construction will be duly investigated in accordance with Council's requirements under the POEO Act.
- Any exceptional incidents that cause dust and/or air emissions, either on or off site, will be recorded, and the action taken to resolve the situation recorded in the logbook.

Operation

- Continue to undertake a air quality and quantity monitoring program in line with Council's requirements until all sites are completely stabilised; monitoring should include details of proposed baseline and air quality following any extended dry periods.
- Subject site rehabilitation, including removal of weeds and revegetation using appropriate native species, to be undertaken to ensure soil stability and prevention of dust generation from the site into the future. Revegetation must be maintained with a survival rate of >80%.

Impacts associated with Air Quality will not be significant if the above Safeguards are implemented and maintained.

4.5 Non-Aboriginal Heritage

4.5.1 Existing environment

The Capertee Valley has a rich cultural history, traditionally home to the Wiradjuri people, with sheep properties established in the area by settlers in the 1840s following James Blackman's journey through the Mudgee area in 1821. Capertee Village itself became a rest stop for travelers to Mudgee due to the location of a good water supply. The Village grew with a few homes, an inn and a post office; in 1882 the railway construction was completed. The Glen Davis Shale Oil Works, located in the Capertee Valley, was one of the largest employers in the area. Producing gasoline, the operation was an important strategic resource during the war era but was closed shortly after once shale oil extraction became uncompetitive with the expansion of the crude oil industry. The dominant land use throughout the region is now agriculture including farming and grazing, which are fundamental to the local economy. Tourism and recreation also play a big role, with visitors exploring the nearby reserves of Wollemi, Turon, Capertee and Gardens of Stone National Park. Disturbance regimes associated with the land uses of the study area include vegetation clearing, cropping and grazing, access tracks, and residential dwellings.

Local, and NSW State historic heritage registers were consulted as part of preparation of this REF document; with one site recorded within 500 m of the Airly Creek study area- Airly (historic homestead on property heritage item ID 1960240 listed on the LCC LEP Instrument no I172) (Figure 8). Given the distance to the actual homestead (approximately 650m), the proposal is highly unlikely to impact on this item of heritage, therefore there is no requirement to consult with Heritage NSW or seek any further approvals to complete works.

4.5.2 Potential Non-Aboriginal Heritage – Construction

Due to the small scale of the subject site, located in previously disturbed construction sites, it is highly unlikely that any items of Non-Aboriginal Heritage would be discovered while replacing the bridges and clearing the groundcover within the subject site.

No impacts to surrounding heritage sites are anticipated to occur as the only site close to the study area is over 500m away; however, there is always potential for the works to uncover unanticipated finds. The Safeguards outlined in Section 4.5.4 provide additional protection and further decrease the risk of any such damage.

4.5.3 Potential Non-Aboriginal Heritage – Operation

No damage or interference to any items or places of Non-Aboriginal Heritage are expected during operation of the bridges.

Table 12 Non-Aboriginal Heritage impacts summary table

Description	Y	N
Are there any items of Non-Aboriginal heritage located within the vicinity (500m) of the proposed works?	X	
If yes, list the item(s) and their heritage significance (i.e. s170 register, Council Register, State Heritage Register, National Heritage Register).	Airly- Heritage item ID 1960240 listed on the LCC LEP no I172	

4.5.4 Environmental Safeguards – Non-Aboriginal Heritage

The following Safeguards for Non-Aboriginal Heritage are part of the Proposal and must be implemented and maintained. Safeguards to be implemented and maintained for Non-Aboriginal Heritage are as follows:

- If archaeological remains or items defined as relics under the NSW Heritage Act 1977 are uncovered during the works, all works must cease in the vicinity of the material/find and Council's Manager Strategic Planning and Environmental Officer and Project Officer are to be contacted immediately.
- Council's workers and all staff must be made aware of any heritage sites and places that occur within the area and all care must be taken to avoid interference with and damage to these sites.
- Heritage sites must be clearly fenced/flagged with removable flagging or other temporary means to delineate their presence and in order to prevent them being harmed during the construction process.

Impacts associated with Non-Aboriginal Heritage will not be significant if the above Safeguards are implemented and maintained.

4.6 Aboriginal Heritage

4.6.1 Existing environment

A search of the Aboriginal Heritage Information Management System (AHIMS) register was conducted in September 2021 and found no previously recorded archaeological sites within the immediate study areas of Coco Creek Bridge and Crown Creek Bridge. Three (3) registered Aboriginal sites were identified within 500m of Airly Creek Bridge (Table 13). A site assessment as part of an Aboriginal Due Diligence (ADD) assessment was completed for the proposal study areas on the 22nd of September 2021. No newly identified archaeological material was identified during the survey. The full ADD report is provided in this report as Appendix C.

The proposed study areas include land that has been disturbed in the past, through previous bridge construction works and subsequent upgrades and maintenance. The archaeological site assessment noted that ground disturbance was high throughout the site and related to road construction works, benching into hillsides and the deposition of fill material along the road verge leading up the bridges (Plate 1).

The ADD assessment concludes that as long as the proposed works are contained to the study area assessed (Figure 1), no further Aboriginal archaeological assessment is required prior to the commencement of bridge replacement works. If the proposed works location is amended, further archaeological assessment may be necessary to determine if the proposed works will impact on Aboriginal objects or archaeological deposits.

An Aboriginal Heritage Site occurs in proximity to the proposed traffic diversion route at Airly Creek. This site has not been assessed as part of the current investigation and LCC and CC will ensure the safety and management of the site during use of the diversion route.

In addition, a search of the National Native Title Register, Register of Native Title Claims and Register of Indigenous Land Use Agreements identified a current claim by the Warrabinga-Wiradjuri. The claim is currently active and has been accepted for registration; however, at this point in time the claim has not been determined, therefore consultation with the Aboriginal community is not required.

Table 13 List of Aboriginal sites identified during AHIMS search

Site ID	Site Name	Context	Recorders
45-1-0252	AC-OC-1; Airly	Open Site	Mrs Robynne Mills
58-1-0720	RPS-AY-010	Open Site	Miss Phillipa Sokol
58-1-0720	RPS-AY-011	Open Site	Miss Phillipa Sokol



Plate 4 Imported fill and ground disturbance along the eastern approach to Crown Creek Bridge

4.6.2 Potential Aboriginal Heritage Impacts – Construction

The level of disturbance (historic and recent) within the study area is high, suggesting that there is a low chance of unidentified intact sub-surface deposits being present within the area. There are, however, several known artefacts within the local vicinity, and given the proximity to a water source, there is always the possibility of encountering unanticipated archaeological material. Potential impacts include disturbance of unknown archaeological material during excavation works, particularly on the riparian zone and road verge (however this has been determined as being highly unlikely).

4.6.3 Potential Aboriginal Heritage Impacts – Operation

No impacts to places, artefacts or Aboriginal Heritage sites are expected during use/operation of the Bridges.

Table 14 Aboriginal Heritage impacts summary table

Description	Y	N	Comments
Are the works likely to disturb previously undisturbed areas of the landscape? Check for good camping sites (flat, near water, availability of bush foods), mountain ridges, spurs or vantage points or rocky outcrops that may have ceremonial significance, and the presence of stone tools, shells or other evidence of human occupation.		X	No – previously disturbed land.
Has an AHIMS register search been conducted?	X		Yes, refer Table 13
Are there any known items of Aboriginal Heritage near the works area (< 1km)?	X		Yes, refer Figure 8 and Appendix C
Is consultation with stakeholders required? E.g. the Local Aboriginal Land Council		X	Native title claim has not been determined.

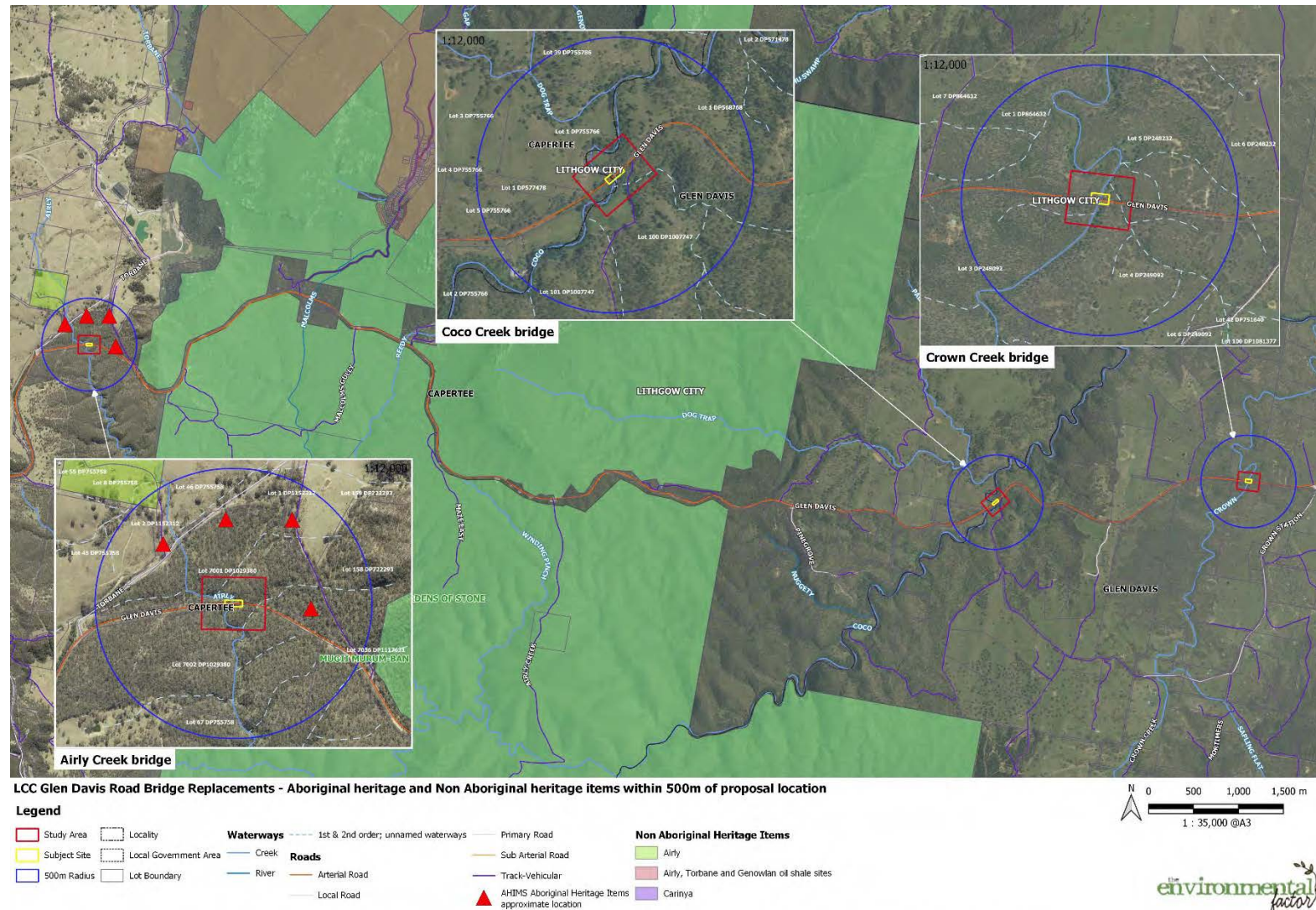
Description	Y	N	Comments
Is a National Parks and Wildlife Act Section 90 Permit (Aboriginal Heritage Impact Permit – AHIP) required for Aboriginal items potentially impacted by the works?		X	No known items within study area and likelihood of uncovering unknown material very low.

4.6.4 Environmental Safeguards – Aboriginal Heritage

The following Safeguards for Aboriginal Heritage are part of the Proposal and must be implemented and maintained. Safeguards to be implemented for Aboriginal Heritage are:

- All staff and visitors should be inducted to site to ensure they are aware of the possible presence of sensitive Aboriginal heritage items located within the vicinity of the work site, and the protective measures that should remain in place throughout the works.
- Should unanticipated archaeological material be encountered during site works, all work must cease, and an archaeologist contacted to make an assessment of the find. Further archaeological assessment and Aboriginal community consultation may be required prior to the recommencement of works. Any objects confirmed to be Aboriginal in origin must be reported to Heritage NSW.
- If sub-surface Aboriginal heritage items are uncovered during the works, all works in the vicinity of the find must cease and the Council's Manager Strategic Planning and Manager Environment or an archaeologist are to be contacted immediately. Works in the vicinity of the find must not re-commence until clearance has been received from those Council officers and the NSW Office of Environment & Heritage. Further archaeological assessment and Aboriginal community consultation may be required prior to the recommencement of works.
- The site along the proposed diversion route at Airly Creek is the responsibility of Council, and has not been assessed herein. TEF/Apex have not undertaken investigations or assessment along the diversion route. LCC has stated that appropriate mitigation measures, including fencing, will be undertaken to protect the site from any potential damage.

Impacts associated with Aboriginal Heritage will not be significant if the above Safeguards are implemented and maintained.



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Figure 8 Aboriginal heritage and non-Aboriginal heritage items within 500m of proposal location

4.7 Biodiversity

4.7.1 Existing Environment

The subject sites occur along a section of Glen Davis Road between Glen Davis and Capertee in NSW. The road is a narrow rural road with no shoulder in most sections. Glen Davis Road passes through two (2) State Conservation Areas (SCA's) with large patches of remnant native vegetation adjacent the road and a small number of private property entrances. The land to the north and south of all of the bridges contains large tracts of remnant native vegetation, with over 22,186 ha throughout Gardens of Stone National Park (south), Muggi Murum-ban State Conservation Area and Capertee National Park (north). The majority of the study area is located on unmapped Land on the Native Vegetation Regulatory map (Figure 12). However, all three (3) creeks are mapped as Vulnerable Regulated Land.

The vegetation communities mapped as present within the three study areas include: PCT 1330 *Yellow Box – Blakelys Red Gum grassy woodland on the tablelands*; PCT 1876 *Capertee Footslopes Box-Stringybark Forest*; PCT 79 *River Red Gum shrub/grass riparian tall woodland or open forest wetland*; PCT 278 *Riparian Blakelys Red Gum – box – shrub – sedge – grass tall open forest*; PCT 1304 *White Box – Narrow-leaved Ironbark grassy woodland*; and PCT 78 *River Red Gum riparian tall woodland / open forest woodland*. The broader locality is dominated by native vegetation with large swathes of cleared agricultural land throughout (Figure 9). Some rubbish and weeds were found to occur in the roadside along Glen Davis Road.

Airly Creek bridge

The subject site of Airly Creek bridge contained intact and high-quality native vegetation surrounding the bridge with some annual weeds present along the roadside. The vegetation on site was found to most closely align with PCT 268 *White Box - Blakely's Red Gum - Long-leaved Box - Nortons Box - Red Stringybark grass-shrub woodland on shallow soils on hills in the NSW South Western Slopes Bioregion* which aligns with TEC - *White Box-Yellow Box-Blakely's Red Gum Woodland and Derived Grassland Critically Endangered Ecological Community (CEEC)* based on the composition of species present.

Canopy species present within the subject site included *Eucalyptus macrorhyncha*, *E. goniocalyx* and *E. blakelyi*. *Eucalyptus cannonii* was possibly present within the southwestern corner of the subject site. Mid-storey strata species included *Acacia dealbata*, *A. implexa*, *Cassinia sifton*, *A. dawsonei*, *Hardenbergia violacea*, *Themeda australis*, *Acaena nova-zelandiae*, *Poa sp.*, *Geranium solanderi*, *Vittadinia cuneata*, *Lepidosperma laterale*, *Lomandra filliformis*, *Clematis aristata* and *Lomandra longifolia*.

The broader study area is mapped as containing PCTs 1330 and 1876, however surveys found that vegetation on site more closely aligns with PCT 323 *Red Stringybark - Inland Scribbly Gum open forest on steep hills in the Mudgee - northern section of the NSW South Western Slopes Bioregion* which occurred on elevated areas surrounding the site. The upper storey species consisted of *Eucalyptus rossii*, *E. macrorhyncha* and scattered *E. cannoni*. Midstorey species were similar to those in the subject site but also included *Acacia verniciflua*, *Lomatia silaifolia* and *Persoonia linearis*. Ground cover species throughout the study area included *Lomandra multiflora*, *Lepidosperma laterale*, *Poa sieberiana*, *Hovea sp.*, *Gonocarpus tetragynus*, *Leucopogon muticus* and *Goodenia hederaceae*. The surrounding vegetation contained numerous habitat features including fallen timber, small and

medium hollows, rocky outcrops and Airly creek as well as a nearby ephemeral creek located to the east of the site. Mugii Murrumbidgee SCA lies to the east of the Airly Creek bridge

The creekline and riparian zone at Airly Creek bridge contained large, open pools with rocky substrate and instream *Typha orientalis* with clear, flowing water. The creekline was concreted under the bridge and banks stabilised with concrete and rock within the subject site. Riparian vegetation south of the bridge consisted of *Poa sieberiana*, *Dianella revoluta*, *Bursaria spinosa*, *Lomandra longifolia* and weed species including *Solanum nigrum* and *Cirsium vulgare*. Vegetation along the northern side of the bridge was also very weedy and there was evidence of historic disturbance. *Phragmites australis* and *Poa labillardieri* was scattered throughout with a larger stand further upstream, with *Verbena rigida* and *Rubus fruticosus* also present.

Coco Creek bridge

The site at Coco Creek was dominated by a mixture of native and exotic vegetation along the creek line with evidence of clearing along the western side of the subject site.

Coco Creek contained clear, slow-moving water over a rocky base at the time of surveys with frog activity evident. The eastern bank of the creek was muddy and vegetated with *Angophora floribunda*, *Casuarina cunninghamiana*, *Lomandra longifolia*, *Melicactus dentatus*, *Bursaria spinosa*, *Adiantum aethiopicum* and *Dichondra repens* present along the stream bank. The western side was pebbly and dominated by *Casuarina cunninghamiana* with scattered *E. blakelyi*, *Lomandra longifolia* and *Melicactus dentatus* throughout.

The site contained scattered rubbish underneath the bridge, including old piping, discarded traffic cones and metal. The creek line itself was dominated by *Casuarina cunninghamiana* constituting PCT 85 River Oak forest and woodland wetland of the NSW South Western Slopes and South Eastern Highlands Bioregion.

Vegetation within the broader study area consisted of *E. goniacalyx*, *Angophora floribunda*, and scattered *E. blakelyi* with *Brachychiton populneus* also present. Mid storey species included *Bursaria spinosa*, *Acacia implexa* and *Hibbertia* sp. with the groundcover including *Adiantum aethiopicum*, *Geranium solanderi*, *Dichondra repens*, *Microlaena stipoides*, *Vittadinia cuneata* and weed species *Hypericum perforatum*, *Plantago lanceolata*, *Carthamus*, *lanatus*, and *Rubus fruticosus*. This vegetation most closely aligns with PCT 268 White Box - Blakely's Red Gum - Long-leaved Box – Norton's Box - Red Stringybark grass-shrub woodland on shallow soils on hills in the NSW South Western Slopes Bioregion which aligns with the TEC White Box-Yellow Box-Blakely's Red Gum Woodland and Derived Grassland Critically Endangered Ecological Community (CEEC).

Crown Creek bridge

Crown Creek subject site contained small areas of regrowth native vegetation along the edges of the road with evidence of historic clearing most likely as a result of bridge repair works.

Crown Creek bridge vegetation contained regrowth canopy species *E. blakelyi*, *Brachychiton populneus*, *E. melliodora* and *Angophora floribunda* with midstory species including *Dodonea viscosa*, *Acacia subulata*, *A. paradoxa* and *A. decora* also present. Ground cover species consisted of *Themeda australis*, *Dichondra repens*, *Juncus usitatus*, *Microlaena stipoides* and *Typha orientalis* with a

moderate to high density of weed species including *Hypericum perforatum*, *Carthamus lanatus*, *Hypochaeris radicata*, *Verbena ridiga*, *Rubus fruticosus* and *Solanum nigrum*.

Outside the subject site, vegetation on both sides of the creek north and south of the subject site was determined to most closely align with PCT 281 *Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion* with varying compositions of canopy species including *E. Blakelyi*, *E. melliodora*, *E. albens*, *E. sideroxylon*, *Callitris endlicheri*, *Brachychiton populneus*, *E. dealbata* and *Angophora floribunda* present. Midstory species included *Acacia subulata*, *A. implexa*, *Dodonea viscosa*, *A. paradoxa* and *Cassinia sp.* with *Lomandra longifolia*, *Lomandra filiformis*, *Hardenbergia violacea*, *Dichondra repens*, *Themeda triandra*, *Cymbopogon refractus*, *Glycine clandestina* and *Vittadinia cuneata* present in the ground layer.

The creek line was largely dominated by a mixture of native and exotic grasses with *Lomandra longifolia*, *Typha orientalis* and some weed species present throughout. Some small ponds and rocks were present to the north (upstream) and south (downstream) of the subject site with low levels of slow-moving water present during surveys.

Overall, the site had a mostly weedy ground cover with some native species present. Crown Creek was moderately degraded under the bridge, with the broader Study area containing habitat of greater quality.

Table 15 Summary of ground-truthed vegetation types within the study area

Vegetation type	Site	Subject Site (ha)	Study area (ha)
PCT 0 – Non native	Coco	0.001	1.19
PCT 85 River Oak forest and woodland wetland of the NSW South Western Slopes and South Eastern Highlands Bioregion (no associated TEC).	Coco	0.12	1.76
PCT 268 White Box - Blakely's Red Gum - Long-leaved Box - Nortons Box - Red Stringybark grass-shrub woodland on shallow soils on hills in the NSW South Western Slopes Bioregion (has associated TEC)	Airly	0.09	0.64
	Coco	0.03	2.02
	Total	0.12	2.66
PCT 281 Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion (has associated TEC)	Crown	0.22	4.85
PCT 323 Red Stringybark - Inland Scribbly Gum open forest on steep hills in the Mudgee - northern section of the NSW South Western Slopes Bioregion (no associated TEC).	Airly	0.05	4.16
Total Native	All sites	0.51	13.44

One (1) Threatened Ecological Community (TEC) was confirmed as occurring within the study areas:

- *White Box-Yellow Box-Blakely's Red Gum Woodland and Derived Grassland*, listed as critically endangered under both the BC and EPBC Act

PCT's 268 and 281 present within the subject sites/ study areas conform to this TEC, representing an area of 7.51 ha across the study areas of all three (3) sites (see Table 16 for breakdown of areas). This TEC was in a moderate condition within the Airly Creek site and study area, with regrowth patches present within the Crown Creek subject site leading to a more patchy and degraded form on this site.

Table 16 PCTs corresponding to TEC within the subject sites and study areas

	<i>Airly 268 (ha)</i>	<i>Crown 281 (ha)</i>	<i>Coco 268 (ha)</i>	<i>All sites</i>
TEC direct	0.09	0.2224	0.0303	0.3427
TEC indirect	0.5531	4.62277	1.9945	7.17037
Total TEC	0.6431	4.84517	2.0248	7.51307

Threatened species

No threatened fauna species were recorded on any of the sites during surveys. One (1) threatened flora species, the Capertee Stringybark (*Eucalyptus cannonii*), was recorded at Airly Creek as five (5) juvenile plants within the subject site and one mature tree in the study area (plus an additional existing record). More individuals are likely to be present within the study area, though a lack of reproductive material present at time of survey inhibited the identification of further individuals at this site. Fifty-one (51) threatened species records occur within a 10 km radius of the subject sites (Figure 10). Of these, the following were found to occur within the respective subject sites and/or study areas:

- ***Airly Creek bridge***

No other records of threatened species occur on the Airly creek site; however Capertee Stringybark records occur within the study area to the north of the site. Gang-gang Cockatoo (*Callocephalon fimbriatum*), Diamond Firetail (*Stagonopleura guttata*) and Scarlet Robin (*Petroica boodang*) records occur within the broader locality (Figure 11).

- ***Coco Creek bridge***

Coco Creek subject site contain Scarlet Robin and Diamond Firetail records with Regent Honeyeater (*Anthochaera Phrygia*), Hooded Robin (*Melanodryas cucullata cucullata*), Swift Parrot (*Lathamus discolor*) and Black-chinned Honeyeater (*Melithreptus gularis gularis*) records present within the Study Area (Figure 11).

- ***Crown Creek bridge***

No threatened species records occur within the subject site for this site; however Swift Parrot and Black-chinned Honeyeater records occur within the Study Area (Figure 12).

A desktop assessment was undertaken to identify threatened flora and fauna species, populations and ecological communities listed under the BC Act, and Matters of National Environmental Significance (MNES) listed under the EPBC Act that may be affected by the Proposal.

For each species and ecological community, the specific habitat requirements have been considered in relation to the natural resources present within the study areas and described accordingly. Based on the presence or absence of important habitat resources required for each species, as well as the location of recent records, habitat connectivity, targeted frog surveys and the age of historical

sightings, a likelihood of occurrence rating has been assigned to reflect the probability of whether each species will frequent and/or rely on resources within the study area (Appendix B).

A Protected Matters Search Tool search (PMST) revealed another thirty-seven (37) species and communities that have the potential to occur within the area. A total eighty-six (86) threatened species and three (3) threatened ecological communities are known or predicted to occur onsite following the desktop analysis (Appendix B). Of these, a total of thirty-two (32) threatened species and one EEC were considered to have a moderate or higher likelihood of being impacted within the subject site; consequently, Tests of Significance were conducted for these species (Appendix B).

Targeted surveys for threatened frogs were undertaken during the appropriate survey season and in appropriate conditions for the species with the potential to occur onsite (*Litoria boorolongensis* and *Mixophyes balbus*). These were not recorded during surveys, however seven (7) other species of amphibia, two (2) mammal species, other aquatic fauna and one (1) turtle were recorded. The results of the surveys and all flora and fauna recorded can be seen in Appendix B.

4.7.2 Potential Biodiversity Impacts – Construction

Approximately **12.93 ha** of native vegetation occurs within the three (3) study areas, with the potential to be impacted by the proposed works. Of this, approximately **0.51 ha** of native vegetation in total may be directly impacted or removed, including some mature trees and overstorey species, representing **3.81 %** of the overall native vegetation present within the immediate study area and **0.002 %** of the broader locality of all three sites combined. All three sites connect well with broader extents of remnant vegetation, with over 22, 186 ha of remnant native vegetation in a 10 km radius, immediately adjacent the sites. No threatened flora species or ecological communities are being significantly affected by the proposed works.

- **Airly Creek bridge**

Works at Airly Creek bridge have the potential to directly impact **0.09 ha** of PCT 268, which occurs along Airly Creek waterway and **0.05 ha** of PCT 323 which occurs in the surrounding landscape. A further **0.55 ha** of PCT 268 and **4.12 ha** of PCT 323 may experience indirect impacts. Approximately eight (8) resprouting *E. goniocalyx*, six (6) *E. blakelyi* and five (5) juvenile *E. cannonii* occur within the impact footprint with the potential for direct impacts as they occur within the subject site. One (1) *E. Cannonii* occurs to the north of the study area and may experience potential indirect impacts. One (1) large hollow bearing *E. goniocalyx* occurs within the direct impact zone and may be potentially removed for crane access during the construction works. It is recommended that this tree be retained due to its size and habitat value.

Airly Creek subject site contains approximately **0.09 ha** of PCT 268 which aligns with a TEC (*White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland - CEEC*). An additional **0.55 ha** of PCT 268 occurs surrounding the subject site for a total combined potential impact to **0.64 ha** of PCT 268. This number is highly conservative and contains the mapped waterway and marginal PCT along an ecotone, with small slithers along the road reserve. Although there is potential direct impact to up to 4 % of TEC, the impact is considered much less (due to location, quality) than this and will consist of indirect impacts only.

- **Coco Creek bridge**

Works at Coco Creek bridge have the potential to directly impact **0.12 ha** of PCT 85 consisting of up to 50 stems of regrowth *Casuarina cunninghamia* which occur along and adjacent to Coco Creek waterway and **0.03 ha** of PCT 268 which occurs in parts of the subject site. A very small (**0.001 ha**) section of non-native vegetation also falls within the subject site. A further **1.64 ha** of PCT 85, **1.99 ha** of PCT 268 and **1.19 ha** of PCT 0 (non-native) may experience indirect impacts. Coco Creek subject site also contains PCT 268 which is analogous to the TEC (*White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland - CEEC*). Up to **0.03 ha** may be directly impacted and a further **1.99 ha** indirectly impacted, for a total potential impact to **2.02 ha** of this TEC, representing approximately **0.05 %** direct impact within a 500 m radius.

- **Crown Creek bridge**

Works at Crown Creek bridge have the potential to directly impact **0.05 ha** of PCT 281 in its derived riparian form, occurring along the creek. An additional **0.17 ha** of PCT 281 occurs adjacent the riparian zone within the subject site. A further **0.21 ha** of PCT 281 (derived) and **4.41 ha** of PCT 281 may experience indirect impacts.

Twenty-one (21) resprouting stems of native Eucalypt and Acacia species were recorded within the impact zone, all with stems less than 15 cm DBH. Dead and young trees will also be impacted for the works, including *E. brachychiton* and *Angophora floribunda*. A large Yellow Box (*E. melliodora*) with a DBH of 88 cm may be removed as part of works if a diversion is put in place. Retention of this tree has been recommended.

The Crown Creek site contains PCT 281 which aligns with TEC *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland*. Within the subject site, this PCT occurs in both the woodland (**0.17 ha**) and derived (**0.05 ha**) formations. The derived form occurs along Crown Creek and the woodland form surrounds the roadside and creek, with a total potential impact including indirect within the study area to **4.85 ha** of PCT 281. This assessment is conservative, with the actual impact to healthy, continuous TEC is considered negligible due to the quality, location and patch size of PCT present.

Potential impacts to the TEC *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* within the study areas has been assessed further in the ToS (Appendix B).

Construction impacts will result in groundcover disturbance and removal as well as creek bed and riparian zone disturbance. Indirect impacts caused by drilling and piling works include temporary increases to noise and dust levels during work hours, potential runoff, and the introduction or further spread of weeds and other pathogens. Noise and dust have the potential to travel long distances and disrupt wildlife outside of the study area. Presence of vehicles, machinery and staff within and surrounding the study area may also temporarily increase localised disturbance to terrestrial and aquatic species that feed or breed in the area during construction. Sedimentation during excavation works may migrate into the creeks and drainage lines. Indirect impacts to vegetation communities within the study area may also occur through increased activity causing dust settling on foliage and potential for the introduction of weeds or other pathogens. Key Threatening Processes relating to the proposal can be seen in Table 17 below.

No long-term effects are likely to be suffered by fauna due to the Proposal considering no direct impacts to important habitat resources, the existing disturbance levels and nature of the site with native vegetation occurring along a roadside already exposed to regular high noise levels from road users and dust from agricultural activities, combined with the small area of native vegetation to be indirectly impacted on a temporary basis, and the availability of alternative habitat within the immediate vicinity. The strict adherence to Safeguards outlined in 4.7.4 will further reduce any potential impacts to individual fauna that may be present during construction works.

The impacts to biodiversity as part of the proposed traffic diversion of the Airly Creek site have not been assessed herein. Council has identified a traffic diversion route for the Airly Creek Bridge works. This route travels along an existing road reserve and Council will liaise with Centennial Coal for use of and risk management of this diversion. This diversion is only suitable for light vehicles (under 4.5t gvm and less than 3.5 m clearance) and any potential associated impacts have not been assessed herein.

Through the Likelihood of Occurrence assessment conducted (Appendix B), considering review of KTP's and field surveys and analyses, it was concluded that the proposal is not likely to have a significant impact on any of the listed threatened biota known or with the potential to occur in the locality and at risk of being impacted by the Proposal.

Table 17 Key threatening processes relevant to the proposal

KTP	Status	Comment
Clearing of native vegetation	BC Act; EPBC Act	The Proposal would result in the clearing of potentially 0.51 ha of native midstory and understory vegetation across the three (3) subject sites. The vegetation is in good condition. The clearing of this vegetation would comprise an increase in the operation of this KTP. The CEMP would include measures to minimise impacts on native vegetation and potentially threatened flora and fauna.
Removal of dead wood and dead trees	BC Act	There are low to moderate quantities of dead wood and dead trees scattered throughout the study area that would provide habitat resources for native fauna, including threatened species. The subject site also contains woody debris which would be removed as a result of the Proposal. The Proposal may increase the operation of this KTP.
Invasion of plant communities by perennial exotic grasses	BC Act	There is the potential for perennial exotic grasses to further invade native vegetation through disturbance during construction of the Proposal. Mitigation measures outlined in Section 4.7.4 are likely to effectively limit the operation of this KTP.
Infection of native plants by <i>Phytophthora cinnamomi</i>	BC Act; EPBC Act	Construction activities have the potential to introduce the root-rot fungus <i>Phytophthora cinnamomi</i> into the broader study area, which could lead to dieback of vegetation. Mitigation measures are likely to effectively limit the operation of this KTP.
Introduction and establishment of Exotic Rust Fungi of the order <i>Pucciniales</i> pathogenic on plants of the family <i>Myrtaceae</i>	BC Act	Construction activities have the potential to introduce Myrtle Rust to the study area. Mitigation measures are likely to effectively limit the operation of this KTP.

KTP	Status	Comment
Infection of frogs by amphibian chytrid causing the disease chytridiomycosis Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants	BC, EPBC Act	All plant and equipment, particularly that which has been used in waterways/instream must be thoroughly checked for plant matter, seeds and other materials and thoroughly cleaned before arriving onsite.

4.7.3 Potential Biodiversity Impacts – Operation

No impacts to flora or fauna are expected during the operation of the three new bridges.

Table 18 Biodiversity impacts summary table

Description	Y	N	Comments
Are the proposed works likely to involve the removal, pruning or damage to any vegetation including, grass cover, shrubs, trees or Endangered Ecological Communities?	X		Potential for removal of mature, habitat trees to install the bridges.
Please list the number of trees and/or hollows to be removed as part of the proposed works.	X		TBC by final construction design and method. Three mature trees occur within the potential direct impact area.
Are the works taking place in a roadside area designated as high or medium conservation value vegetation?	X		Remnant roadside vegetation is mapped as high conservation value.
Are there any threatened, endangered, or native flora and/or fauna located within the vicinity of the proposed works?	X		A number of threatened flora and fauna species are recorded as occurring within the locality (Appendix B). No significant impact to any of the species with the potential to occur is expected.

4.7.4 Environmental Safeguards – Biodiversity

The Environmental Safeguards for Biodiversity are considered part of the Proposal and must be implemented. Safeguards to be implemented for Biodiversity are:

Timing of Clearing (terrestrial and aquatic)

- Where practicable, it is recommended to time the works outside of key bird and frog breeding seasons to avoid nest abandonment, breeding disruption, injury or death to native fauna. The works are proposed to occur in the winter of 2022, which falls outside of the breeding season for frog species of concern and also avoids the breeding season of most birds. Some owls breed within late winter, however no large tree hollows suitable for nesting owls will be directly impacted by the works and works are to take place during daylight hours.

Vegetation Removal

- Clearly delineate vegetation to be removed/retained with the assistance of an ecologist, or similarly qualified professional, and induct all site personnel as to the approved extent of clearing. Ensure that no clearing of vegetation occurs outside of the marked boundary.
- Where any trees requiring removal contain hollows, nests or other signs of occupation, a staged clearing approach must be undertaken where hollow limbs are removed carefully and incrementally by a qualified tree surgeon/arborist. Care should be taken to inspect limbs for fauna prior to their removal.
- Prior to clearing, a preclearance survey should be undertaken including inspection of hollows to confirm occupation by fauna. Care should be taken to identify nests and/or roosting sites. If fauna habitat is present (nests or potential tree hollows) the Council or Council's appointed contractor would contact the project ecologist for further advice prior to clearing.
- Ensure the presence of an ecologist or fauna spotter catcher at all times during pre-clearing and clearing activities (including instream) to remove and relocate wildlife as necessary, and to attend to any wildlife that are injured as a result of works.
- All tree hollows removed are to be replaced with artificial hollows (nest boxes or augmented hollows) at a rate of 2:1. The size of nest box entrances is to be suited to the requirements of the threatened species that occupy the area/matched to those that have been removed. Nest boxes should be erected near the habitat to be removed in a suitable position prior to the commencement of vegetation clearing works. The project ecologist should be consulted to determine appropriate size and number to be erected.
- Felled trees or existing logs must be placed strategically and in proximity to the work site to provide refuge and potential habitat in the understorey whilst ensuring no further damage to surrounding vegetation. Placement of logs and felled trees will also aid in the regeneration of the area.
- Where additional vegetation removal is proposed this must first be assessed to consider the cumulative impacts against the approved clearance footprint, and if appropriate supervised by a qualified ecologist and Council's Environmental Officer.

Habitat Protection - terrestrial

- Clearly delineate vegetation to be removed/retained with the assistance of an ecologist, or similarly qualified professional, and induct all site personnel as to the approved extent of clearing. Ensure that no clearing of vegetation occurs outside of the marked boundary.
- The presence of a suitably qualified arborist is recommended during earthworks occurring near retained trees to avoid rootzones impacts.
- Ensure all work crew understand the importance of habitat features onsite including rocky outcrops, pools, stags, fallen timber and logs. Avoid impact to all habitat within the subject site wherever possible.
- All bridges are to be inspected for roosting bats/ birds and other fauna prior to works commencing and at the start of each workday.

Habitat Protection - aquatic

- Pools are to be checked for any signs of frogs, tadpoles, fish and any other aquatic life prior to works commencing.

- Divert waterflows around the site when working within streambeds for all bridges, ensuring water movement is maintained along the creeks at all times. If a dry works area is required, flow diversion pumping may be required.
- All snags, boulders and woody debris are to remain in place where possible.
- Multiple stage Erosion and Sediment Controls (ERSED) are to be installed and maintained throughout the construction phase of the project and removed once all areas are stabilised.
- Downstream monitoring of water quality using turbidity parameters (to be detailed in the CEMP) is to occur prior to and during construction works. No downstream siltation is to occur, and only clean water is to leave the site to ensure protection of downstream aquatic habitats.
- Any weeds or species of concern are to be removed from the subject sites and Council is to be notified

Rehabilitation

- Revegetation activities will be undertaken using native species sourced from local seed wherever possible. Areas to be re-seeded may be marked in the CEMP as a record of rehabilitation efforts made. Vegetation cover should be returned to the site within a reasonably practicable timeframe post clearing to reduce soil exposure and loss.
- Stream banks should be reinstated as near as practicable to their original profile. Where required, geofabric, which remains permeable to water and enhances plant growth, should be used to stabilise soil and sediment during re-establishment.

General

- Vehicles and machinery (including cranes) to work from the sealed road wherever possible and not to extend beyond the direct impact footprint.
- Ensure vehicles and machinery are cleaned and checked for any traces of weeds, seeds and mud prior to entering work site.
- All soils to be stockpiled at designated stockpile locations in a cleared area, within pre-approved zones.
- Appropriate erosion and sediment migration reduction/control measures should be in place.
- Heavy vehicles are not to be parked under tree drip lines/ leaf canopy to avoid compaction of soil, which is damaging to mature native trees and can cause dieback or tree mortality.
- All machinery and vehicles are to be clean and inspected prior to arriving on-site to reduce the spread of weeds and disease (e.g., *Phytophthora cinnamomi*) to the site.
- Strict hygiene protocols must be followed to ensure that no environmental weeds spread around during works or are introduced to site as a result of the proposed works. If weeds are accidentally transported to site, or identified during construction activities, all weed material should be immediately contained and removed from site.
- Locate stockpile sites away from waterways, drainage lines and native vegetation. Ensure these are appropriately stabilized in accordance with the 'Blue Book' (Landcom 2004).
- Declared weeds must be managed according to requirements under the Biosecurity Act 2015. It is recommended that all Weeds of National Significance should be managed to ensure they do not spread, and where possible eradicated.

Impacts associated with Biodiversity will not be significant if the above Safeguards are implemented and maintained.



Plate 5 Airly Creek bridge with PCT 268 within the subject site



Plate 6 Aquatic habitat and concreted channel under Airly bridge



Plate 7 PCT 323 within the Study Area of Airly Ck



Plate 8 Airly Creek south of the subject site with surrounding vegetation and habitat features



Plate 9 Coco Creek bridge and surrounding vegetation – PCT 85



Plate 10 Casuarina (PCT 85) directly adjacent Coco Creek bridge



Plate 11 PCT 268 south of Coco Creek bridge



Plate 12 Coco Creek with rocky substrate and habitat



Plate 13 Crown Creek bridge and subject site showing PCT 281



Plate 14 PCT 281 within Crown Creek Study area



Plate 15 Crown Creek bridge with a predominately dry creek bed at time of survey (September 2021)



Plate 16 upstream pools of water, within the Crown Creek study area

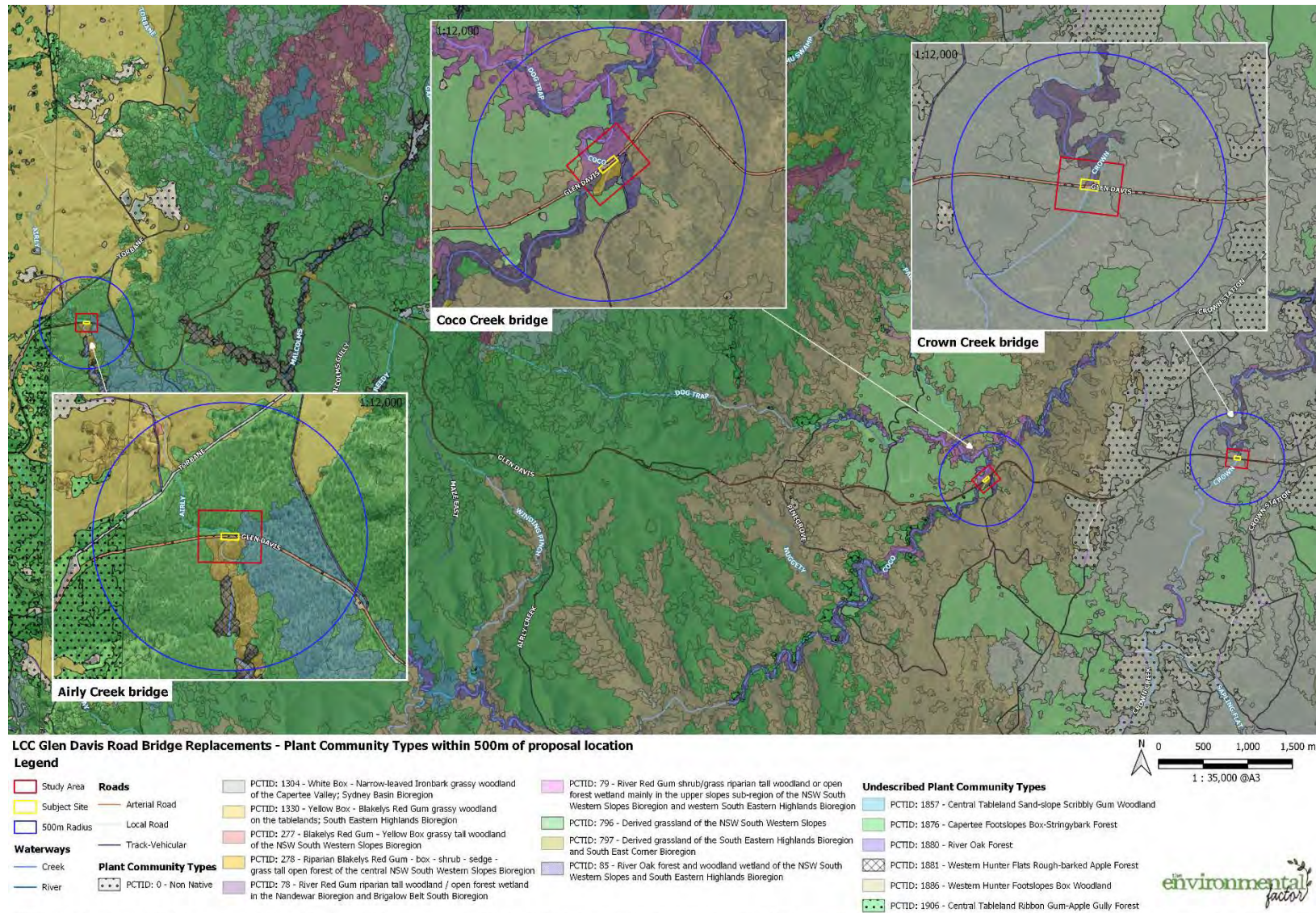
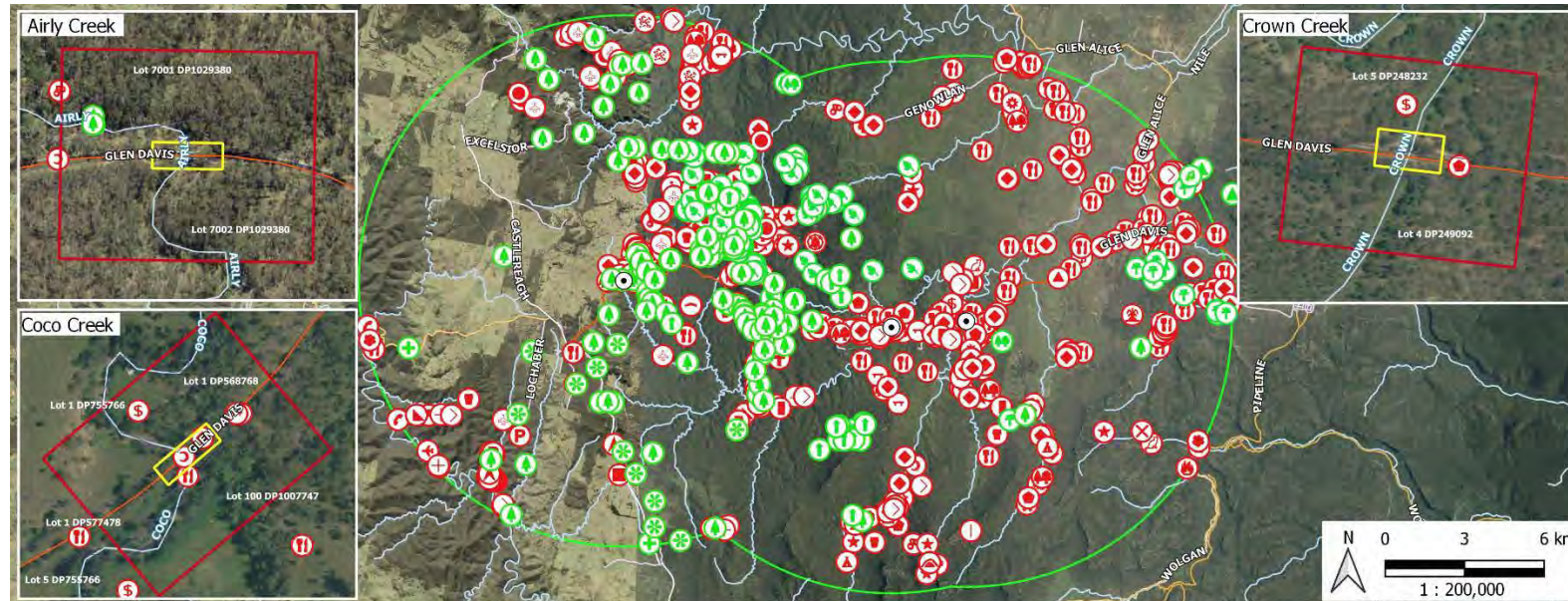


Figure 9 Plant community types within 500 m of proposal location



LCC Glen Davis Road Bridge Replacement - Threatened Species within a 10km radius of proposed bridge works

Legend

Subject Site	RIVER	Diamond Firetail	Hooded Robin (south-eastern form)	Painted Honeyeater	Stuttering Frog
Study Area	Threatened Species	Dusky Woodswallow	Koala	Powerful Owl	Swift Parrot
10km radius	Barking Owl	Eastern Cave Bat	Large Bent-winged Bat	Regent Honeyeater	Turquoise Parrot
Bridges	Black Falcon	Eastern False Pipistrelle	Large-eared Pied Bat	Rosenberg's Goanna	Varied Sittella
Roads	Black Gum	Flame Robin	Little Bent-winged Bat	Rylstone Bell	White-throated Needletail
Arterial Road	Black-chinned Honeyeater (eastern subspecies)	Gang-gang Cockatoo	Little Eagle	Scarlet Robin	Wollemi Mint-bush
Local Road	Booroolong Frog	Glossy Black-Cockatoo	Little Lorikeet	Sooty Owl	Yellow-bellied Sheath-tail-bat
Primary Road	Broad-headed Snake	Greater Broad-nosed Bat	Masked Owl	Speckled Warbler	Darwinia peduncularis
Sub Arterial Road	Brown Treecreeper (eastern subspecies)	Greater Glider	Mount Vincent Mint-bush	Spotted-tailed Quoll	Grevillea obtusiflora
Waterways	Capertee Stringybark	Grey-crowned Babbler (eastern subspecies)	New Holland Mouse	Square-tailed Kite	Phebalium bifidum
CREEK	Clandulla Geebung	Grey-headed Flying-fox	Oriental Cuckoo	Squirrel Glider	Pultenaea sp. Genowlan Point

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Figure 10 Threatened species within a 10 km radius of proposed bridge works

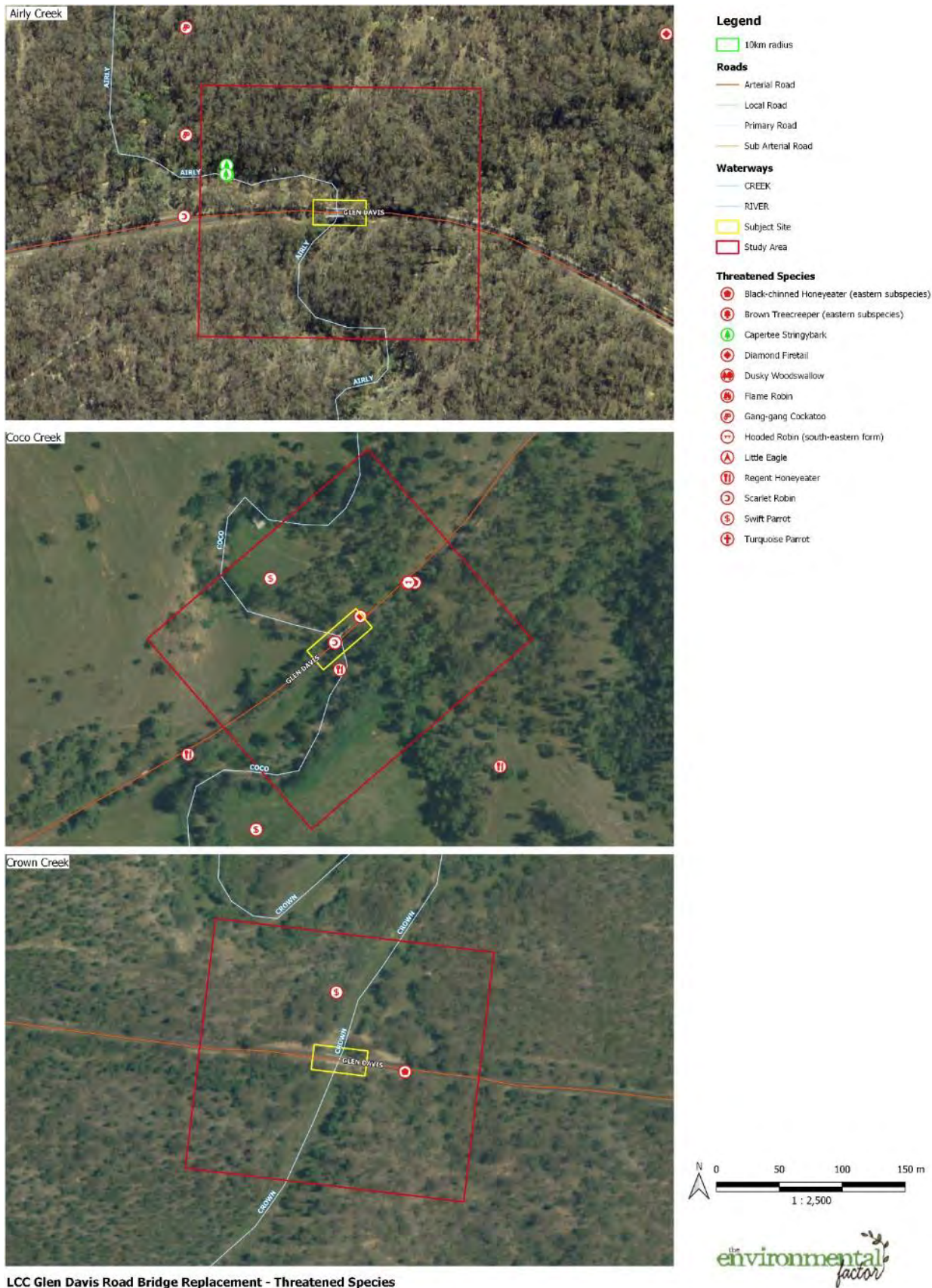


Figure 11 Threatened species records within and surrounding the Study Areas



4.8 Traffic and Transport

4.8.1 Existing environment

All three bridges are accessed via Glen Davis Road, either from the Castlereagh Highway through Capertee at the western extent or Glen Alice Rd at the eastern extent. Glen Davis Rd is a small rural road linking Capertee to Glen Alice and provides local access to properties in and around Glen Davis. The road experiences local traffic by rural residents and minor, irregular thoroughfare of farm machinery, trucks and heavy vehicles.

During the site inspection, trucks and regular heavy vehicles travelling between regional towns were observed travelling at speed along Glen Davis Rd. Larger vehicles transporting heavy construction machinery were observed having to slow down before crossing the bridges due to their narrow width.

4.8.2 Potential Traffic and Transport Impacts – Construction

The proposed bridge replacement and associated construction is located on a public road, and therefore traffic control will be required during construction to facilitate the movement of traffic while initial site preparation works are being completed. It will be necessary to completely close the road on at least one (1) occasion for 10-13 weeks while the bridges are demolished, replaced, and then assessed before being reopened to the public. Since Crown Creek crossing has the potential for a diversion road around to the northern side of the bridge, it is expected that road closures will only be required for works at Coco creek crossing. Council has identified a traffic diversion route for the Airly Creek Bridge works. This route travels along an existing road reserve and Council will liaise with Centennial Coal for use of and risk management of this diversion. This diversion is only suitable for light vehicles (under 4.5t gvm and less than 3.5 m clearance).

For the duration of road closures, local residents who are blocked from accessing their properties will need to divert via Kandos. This will mean a potential diversion route of between 95km-115km using the Castlereagh highway, Bylong Valley Way, local roads through Kandos, Dabee Rd and Glen Alice Rd. Since traffic along Glen Davis Rd is minimal, it is not anticipated that there will be significant increase in road users using the diversion routes during the construction periods.

4.8.3 Potential Traffic and Transport Impacts – Operation

No detrimental or negative impacts to traffic or transport are expected during use/operation of the new bridges; conversely, the modern, dual carriageway bridges are anticipated to improve safety and general outcomes for road users.

Table 19 Traffic and Transport impacts summary table

Description	Y	N	Comments
Are the proposed works likely to result in major detours or disruptions to traffic flow (vehicular, cycle and pedestrian) or access to properties or businesses?	X		Access to local properties in Glen Davis and surrounds will be temporarily impacted by the closure of the road on at least 2 occasions resulting in significant detour distance via Kandos.
Will there be any permanent major detours made as a consequence of the works?		X	Detours will be temporary and short in duration.

4.8.4 Environmental Safeguards – Traffic and Transport

The Environmental Safeguards for Traffic and Transport are considered part of the Proposal and must be implemented. Safeguards to be implemented for Traffic and Transport are:

Construction

- Consider the location of designated parking areas, stockpile locations, construction laydown sites, site offices, and access routes carefully in consideration of creating inconveniences to local residents, and to the other environmental constraints.
- Works are to minimise impacts to residents/landholders by very careful planning of the timing of road closures and effective communication with residents and other road users.
- All road signs and marking will be in accordance with the RMS Guide to Signs and Markings; Australian Standards AS1742 and AS1743; and the Australian Roads Guide to Traffic Management.
- Traffic and transport complaints are to be monitored and addressed promptly where practicable.
- Council is to liaise with Centennial Coal (CC) to ensure the proposed traffic diversion for the Airly Creek site is appropriately managed and all safety measures are adhered to. TEF has not assessed herein the diversion and responsibility remains with Council to ensure all planning, safety, access and traffic control measures are adhered to.

Operation

Routine maintenance checks should be completed on each bridge to ensure ongoing road user safety.

Impacts associated with Traffic and Transport will not be significant if the above Safeguards are implemented and maintained.

4.9 Socio-economic Considerations

4.9.1 Existing environment

Glen Davis is a small rural community with a population of 115. The 2016 census details Technicians and Trade Workers as the top employment area for the area. Other employment areas listed for the small population are managers, labourers and community and personal service workers.

While the Proposal is within the Lithgow City Council LGA, the benefits of the bridge upgrade will be felt by other surrounding Council areas. Ultimately, the Proposal seeks to improve rural road quality and safety for the benefit of the wider region.

Glen Davis Road and the three (3) creek crossings occur in a mixed rural area and natural bushland setting. There are a number of properties with access from Glen Davis road, however no residential properties have been identified within 500m of any of the study areas; however, residents in the broader area are likely to utilise Glen Davis Road and the crossings routinely to access the larger townships to the north and south. The study areas and vicinity fall within RU1 – Primary Production, RU2 – Rural Landscape and Crown land zoning (Figure 2).

4.9.2 Potential Socio-economic Impacts – Construction

During the construction phase of the Proposal, it is expected that a civil construction firm will be employed to demolish the existing timber bridges and install modern replacements. The exact number of contractors and the total duration of employment of personnel will be confirmed in early February 2022 when the construction contract is finalized. The Proposal is being funded by TfNSW, and it is anticipated that contractors will provide income to local cafes, businesses, and accommodation providers throughout the duration of the construction.

The closure of Glen Davis Road during construction is expected to impact both local Glen Davis residents and residents in adjoining communities who use the road. While this disruption is limited to the construction phase of 10-13 weeks per bridge, the resulting detour via Kandos for residents will be substantial. This will result in considerable inconvenience for those impacted as well as lost time and reduced productivity for the local agricultural sector.

4.9.3 Potential Socio-economic Impacts – Operation

The operation of the bridges is anticipated to provide positive socio-economic impacts during its operation as it provides improved rural road infrastructure for the benefit of the tourism and agricultural industries.

Table 20 Socio-economic Considerations impacts summary table

Description	Y	N	Comments
Are the proposed works likely to impact on local business, require any property acquisition, or alter any access or parking arrangements for properties (either temporarily or permanently)?	X		No property acquisition or alteration to access or parking arrangements for properties required. However, there will be disruption to local residents through road closures during construction phase.

4.9.4 Environmental Safeguards – Socio-economic considerations

The Environmental Safeguards for Socio-economic Considerations are considered part of the Proposal and must be implemented.

Safeguards to be implemented for Socio-economic impacts are:

- Considerate construction practices are to be implemented at all times during works, including the construction site is to be left in a clean and tidy manner at the end of each workday, and noise, air quality and visual amenity impacts are to be kept to a minimum.
- All materials purchased for the Proposal are to be of highest quality and most sustainable as possible, to reduce impacts to community and ratepayers through replacement of low-quality or faulty equipment in the future.
- Quality assurance is to be applied to all aspects of the Proposal, including design and construction to ensure best value for the local community.
- Disruption of traffic is to be minimised wherever possible and clear communication and planning between construction crew and landowners is to be undertaken.
- Community engagement is to be undertaken to obtain feedback on concerns, and address issues as they arise.
- Construction machinery and work vehicles to be discretely parked when not in use to reduce visual impact and ensure safe pullover is available where possible.

The Proposal will not have significant negative impacts on Socio-economic Considerations if the above Safeguards are implemented and maintained.

4.10 Waste and Resource Use

4.10.1 Existing environment

The subject sites included ecologically sensitive waterways surrounded by remnant bushland and agricultural properties. Excluding fence and bridge construction and some corrugated iron structures below the Coco creek bridge, only minor anthropogenic disturbance in the form of discarded waste was observed on site and the area was considered tidy and waste-free.

4.10.2 Potential Waste and Resource Use Impacts – Construction

Waste products generated by the construction phase of the Proposal may include but are not limited to:

- Soil and spoil and, excess civil construction materials
- Cleared vegetation
- Packaging
- Domestic and general waste, and
- Chemical wastes.

The construction of the proposed bridges is anticipated to use finite resources, in the form of steel, concrete, road surface materials and plastic, as well as consumption of fuel, water and electricity as part of construction activities.

4.10.3 Potential Waste and Resource Use Impacts – Operation

Waste products will be generated as part of any future maintenance and repair activities on the bridges.

Table 21 Waste impacts summary table

Description	Y	N	Comments
Are the proposed works likely to generate >200 tonnes of waste material (contaminated and /or non-contaminated material)?		X	No; most excavated material will be reused in site stabilization works. Material removed during drilling will be removed from site and disposed of appropriately.
Are the proposed works likely to require a Licence from NSW EPA for waste?		X	No; the works do not and will not require discharges to the environment.
Will the ongoing operation of the site post completion of works generate significant amount of waste?		X	Minimal wastes will be generated unless the infrastructure is replaced in future.

4.10.4 Environmental Safeguards – Waste and Resource Use

The Environmental Safeguards for Waste and Resource use are considered part of the Proposal and must be implemented.

Safeguards, with regard to waste in general, to be implemented are:

- All wastes generated as part of this Proposal will be managed in accordance with the *Protection of the Environment Operations Act 1997*, and EPA and Council guidelines.
- Resource management hierarchy principles are to be followed; namely, the avoidance, reduction, reuse and recycling of resources.

- If stockpile or laydown sites for excess construction materials, spoil or other wastes are required in locations that have not been considered as occurring within the impact footprint as part of this REF, additional approval will need to be sought prior to any clearing taking place.
- Requirements under the Landcom (2004) stockpile management procedure must be observed, including correct placement of earth banks (with sedimentation ponds) to divert water around stockpiles if placed on a slope, and/or filter fences erected below stockpiles to capture any sediment moving offsite.
- Bulk project waste (e.g., clean virgin excavated natural material or clean fill) sent to a site not owned by Council (excluding DPIE licensed landfills) for land disposal is to have prior formal written approval from the landowner.
- Waste is not to be burnt on site and all general waste will be contained and disposed of at suitable waste facilities.
- Where possible, materials with recycled content will be sourced, and minimum quantities ordered to reduce wastage.
- If contamination is encountered during construction, a site assessment must be undertaken in accordance with the *Protection of the Environment Operations Act 1997* (POEO Act).
- Toilets will be provided for construction workers for the duration of the works to prevent human wastes entering the waterway.
- Waste management for construction projects should be undertaken in accordance with the *NSW Waste Avoidance and Resource Recovery Act 2001*. The objectives of the Act are:
 - To encourage the most efficient use of resources and to reduce environmental harm in accordance with the principles of Ecologically Sustainable Development (ESD),
 - To ensure that resource management options are considered against a hierarchy of the following order: Avoidance of unnecessary resource consumption, Resource recovery (including reuse, reprocessing, recycling and energy recovery), Disposal.
 - To provide for the continual reduction in waste generation,
 - To minimize the consumption of natural resources and the final disposal of waste by encouraging the avoidance of waste and the reuse and recycling of waste,
 - To ensure that industry shares with the community the responsibility for reducing and dealing with waste,
 - To ensure the efficient funding of waste and resource management planning, programs and service delivery,
 - To achieve integrated waste and resource management planning, programs and service delivery on a State-wide basis,
 - To assist in the achievement of the objectives of the *Protection of the Environment Operations Act 1997*.
- Don't over-order.

The Proposal will not have significant negative impacts on waste generation and resource use if the above Safeguards are implemented and maintained.

4.11 Visual Amenity

4.11.1 Existing environment

The existing environment provides good quality visual amenity. The study area is located in a rural area with a varied landscape setting. The drive along Glen Davis Road provides views of native woodland within protected reserves, waterways and open landscapes with mountains in the backdrop. The area is not densely populated and located far enough out of town to limit interference by the public. The general amenity along Glen Davis Road is pleasant with remnant native vegetation, minimal litter and tidy property entryways present.



Plate 17 Views along Glen Davis Rd

4.11.2 Potential Visual Amenity Impacts – Construction

During construction, the proposed works would affect the visual environment by the presence of machinery, construction vehicles and equipment. The machinery and scale of works required for the bridge replacement works are not significant, and since the road on either side of works will be closed, as well as the absence of nearby sensitive receivers, the impact on visual amenity during construction is not expected to be significant.

4.11.3 Potential Visual Amenity Impacts – Operation

Since the proposal involves replacement of current infrastructure, operation of the proposal is not expected to have a significant impact on the site's visual amenity.

Table 22 Visual Amenity impacts summary table

Description	Y	N	Comments
Are the proposed works likely to have an impact on the visual amenity of the surrounding area? (i.e. removal of vegetation, stockpile sites, road widening etc.)	X		Temporary construction presence that may be visible from Glen Davis Rd. Assuming new bridges are of a similar style to the current infrastructure and occupy the same footprint within the waterway, no significant ongoing impact on visual amenity expected.

4.11.4 Environmental Safeguards – Visual amenity

The Environmental Safeguards for Visual Amenity are considered part of the Proposal and must be implemented. Safeguards to be implemented with regards to Visual Amenity are:

- Considerate construction practices are to be implemented at all times, to ensure the works areas are neat and visually not offensive, including to be kept free from rubbish, and stockpile sites actively managed.
- Vehicles are to be parked in designated areas only.
- No additional, unauthorized clearing or destruction of vegetation is to occur.
- Cleared, bare patches of ground that form part of the works are to be revegetated and restored following cessation of works.
- Obvious and intrusive signs/machinery/equipment are to be removed from the site at the first opportunity.
- Any complaints received regarding visual amenity at the site are to be dealt with and rectified as soon as possible.

The Proposal will not have significant negative impacts on Visual Amenity if the above Safeguards are implemented and maintained.

4.12 Climate Change

4.12.1 Existing Environment

Limited meteorological data for the area is available from the now closed Bureau of Meteorology (BoM) Glen Davis (The Gullies) weather station. The weather station was located approximately 15 km east of the subject site and previously recorded observations of several meteorological data including temperature, humidity and rainfall, wind speed and wind direction.

Temperature data recorded at the Glen Davis AWS indicates that January is the hottest month of the year, with a mean daily maximum temperature of 30.3°C. July is the coolest month with a mean daily maximum temperature of 15.4°C.

Rainfall is typically uniform across the seasons, with some variability experienced from year to year. February is recorded as the wettest month with an average rainfall of 72.7 mm falling, with September the driest month at 36.8 mm. The yearly average stands at 644.5 mm of rain.

Table 23 Long-term climate averages at the closest weather station (Glen Davis 063061)

Observation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean observations													
Maximum Temperature (°C)	30.3	28.9	27.1	22.7	19.1	15.7	15.4	17.2	21.1	24.0	26.9	29.3	23.1
Rainfall (mm)	70.2	72.7	47.2	43.9	39.2	58.4	39.9	47.5	36.8	57.5	60.2	60.6	644.5

Climate Change predictions

The NSW Government Office of Environment and Heritage (OEH) AdaptNSW division 'Climate Change snapshot' for Central West and Orana, states that the region is projected to continue to warm during the near future (2020 – 2039) and far future (2060 – 2079), compared to recent years (1990 – 2009). There is very high confidence that the average temperatures will increase across seasons. Warming is projected to be on average about 0.7°C in the near future, increasing to about 2.1°C in the far future. The number of hot days is projected to increase and the number of cold nights is projected to decrease.

Climate change projections are presented for emission scenarios that will impact the degree to which the climate is altered in the future; each of these is referred to as a 'representative concentration pathway' (RCP), and is representative of the concentration of global GHG emissions in the atmosphere under different emissions scenarios. For example, if GHG emissions are mitigated and reduced, the scenario is for 'low emissions' and is referred to as RCP 2.6; conversely, if little effort is made to reduce emissions and the current scenario is continued globally, a 'high emissions' concentration is referred to as RCP 8.5, indicating a high concentration of GHG emissions in the atmosphere moving forward, with potentially devastating impacts by the year 2100.

Under a high emissions scenario (RCP8.5), NSW and the ACT can expect an average annual temperature increase of around 1.4 - 2.3 °C, whereas large and sustained reductions in global GHG emissions (RCP2.6) reduce projected warming to around 0.7 - 1.4 °C. Specifically for Lithgow, under emissions scenario RCP 8.5 for the projected time period of 2090, an increase in temperature of 4.2

°C is expected, combined with a drop of -23 % for rainfall (Climate Change in Australia, Analogues Explorer, 2021).

Lithgow is projected to experience an additional 5 to 10 hot days per year compared with the current average.

The Lithgow region is predicted to experience an increase in rainfall across Summer, Autumn and Spring, and a decrease in Winter; rainfall changes are associated with changes in extremes, such as floods and droughts. The changes to water quality, potential for erosion and sediment migration, damage to infrastructure and localized flooding complications are associated with these sudden or extreme changes.

The subject sites occur within a designated bushfire prone area (NSW Rural Fire Service, 2021). In addition, a harsher fire-weather climate is predicted in the future (high confidence), improved and safer access in the area will help to ensure the safety of the community.

4.12.2 Potential Climate Change Impacts – Construction

Throughout the construction phase of the Proposal there will be use of in-demand materials. Use of these materials diminishes the availability of some resources for future use and contributes to pollution and GHG emissions through both direct use of fuels and the embodied energy used in the production of construction materials, and in association with the disposal of related waste products. The use of fossil fuels would also contribute to impacts on climate and air quality. While these impacts would be negligible on global or national scales, efficient resource use should be adopted as a general operating principle, including use of locally sourced materials and locally based construction crews to reduce 'carbon miles' and increase efficiencies.

4.12.3 Potential Climate Change Impacts – Operation

Potential impacts to climate change are not expected during use/operation of the proposed bridges. However, impacts from climate change, including possible changes to flooding regimes along all three creeks and the increased risk of bushfire, may impact on the operation of the bridges over time.

4.12.4 Environmental Safeguards – Climate Change

The following Safeguards for Climate Change are part of the Proposal and must be implemented and maintained as part of project delivery.

Safeguards to be implemented with regards to Climate Change are:

Construction

- Resource management hierarchy principles are to be followed:
 - Avoid unnecessary resource consumption as a priority,
 - Avoidance is followed by resource recovery (including reuse of materials, reprocessing, recycling and energy recovery),
 - Disposal is undertaken as a last resort (in accordance with the *Waste Avoidance & Resource Recovery Act 2001*).
- Quality assurance and life cycle of materials are to be considered when purchasing, to ensure the newly built infrastructure is resilient and structurally sound.

- Local resources and labour are to be used wherever possible, to reduce waste and emissions, and increase efficiencies.

Operation

- Regular maintenance of structure to reduce degradation and increase lifespan.

Provided the above Safeguards are implemented as part of the Proposal, the Proposal is not likely to have a significant impact on Climate Change.

5 CONSIDERATION OF STATE AND COMMONWEALTH ENVIRONMENTAL FACTORS

This section considers the Proposal against key legislation and government policy. This section does not describe the legislation and policy in detail and guidance provided here does not constitute legal advice.

5.1 Matters of National Environmental Significance

Under the environmental assessment provisions of the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act), the following Matters of National Environmental Significance (MNES) are required to be considered to assist in determining whether the Proposal should be referred to the Australian Government Department of Agriculture, Water and the Environment (DAWE).

Table 24 Compliance with EPBC Act 1999

Factor	Impact
Any impact on a World Heritage property?	Nil
Any impact on a National Heritage place?	Nil
Any impact on a wetland of international importance?	Nil
Any impact on a listed threatened species or communities?	Nil
Any impacts on listed migratory species?	Unlikely
Any impact on a Commonwealth marine area?	Nil
Any impact on the Great Barrier Reef Marine Park?	Nil
Does the proposal involve a nuclear action (including uranium mining)?	Nil
Additionally, any impact (direct or indirect) on Commonwealth land?	Nil

5.2 Environmental Planning and Assessment Regulation, 2000 Checklist

The factors which need to be taken into account when considering the environmental impact of an activity are listed in Clause 228(2) of the *Environmental Planning and Assessment Regulation 2000*. Those factors have been taken into account when assessing the likely impacts of the Proposal on the natural and built environment in this REF and are summarised in Table 23 below.

As LCC is the Proponent for the overall Proposal, the Proposal will be scheduled to be completed so as to minimise any cumulative effects of any separate proposals proceeding at the same time, including the timing of construction of each bridge.

Table 25 Compliance with Clause 228(2) of the EP&A Regulation 2000

Environmental Factor	Will there be an impact?	Comments
(a) Any environmental impact on a community?	Yes	<p>Construction: minor, short-term impacts are expected due to road closures during construction are anticipated.</p> <p>Operation: positive outcomes for the Glen Davis and surrounding community through improved quality of rural road.</p>
(b) Any transformation of a locality?	Yes	<p>Construction: removal of the old bridges and excavation of each site will cause localized, temporary detrimental effects.</p> <p>Operation: minor changes to the environment surrounding the 3 creek crossings with permanent bridge structures that are of a different design from previous are expected.</p>
(c) Any environmental impact on the ecosystems of a locality?	Minor	<p>Construction: minor, temporary impacts to flora and fauna and downstream ecosystems at the site are expected. These are expected to be negligible if all the Environmental Safeguards are adhered to.</p> <p>Operation: resumption of use of the sites as operational roads post completion of the construction phase is not expected to result in significant impacts to ecosystems in the locality, provided Environmental Safeguards are implemented.</p>
(d) Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality?	No	<p>Construction: assuming all the Environmental Safeguards are adhered to, temporary reduction in aesthetic, scientific or other environmental quality of values of the locality are expected to be negligible.</p> <p>Operation: the new bridges are expected to improve the locality aesthetically, environmentally and for human safety</p>
(e) Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present generations?	No	Assuming all the Environmental Safeguards are adhered to.

Environmental Factor	Will there be an impact?	Comments
(f) Any impact on habitat of any protected fauna (within the meaning of the National Parks and Wildlife Act 1974)?	Minor	Assuming all the Environmental Safeguards are adhered to, impacts to protected fauna are not anticipated to be significant.
(g) Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air?	No	Assuming all the Environmental Safeguards are adhered to, the Proposal is not anticipated to endanger any species or communities.
(h) Any long-term effects on the environment?	No	Assuming all the Environmental Safeguards are adhered to.
(i) Any degradation of the quality of the environment?	No	Assuming all the Environmental Safeguards are adhered to.
(j) Any risk to the safety of the environment?	No	The Proposal is designed and anticipated to reduce risk to the community through replacement of single-lane, dilapidated bridges with new, dual carriageway bridges that meet modern safety standards.
(k) Any reduction in the range of beneficial uses of the environment?	No	
(l) Any pollution of the environment?	No	Assuming all the Environmental Safeguards are adhered to, the Proposal is not anticipated to result in pollution of the environment.
(m) Any environmental problems associated with the disposal of waste?	Minor	Construction: the Proposal is not anticipated to generate significant wastes
(n) Any increased demands on resources, natural or otherwise which are, or are likely to become, in short supply?	Minor	Construction: the Proposal includes use of in-demand resources, including fossil fuels, concrete and metal. Operation: the bridges are anticipated to have a life-cycle of a minimum of 50 years, and will be designed to withstand a changing climate, reducing the need for maintenance, repairs and replacement in the short term.
(o) Any cumulative environmental effect with other existing or likely future activities?	Unlikely	The Proposal is anticipated to have localized, minor and short-term impacts on the environment. If all Environmental Safeguards are implemented. Council, as the Proponent for the 3 upgrades, can time works to reduce cumulative impacts between them, and also with other projects within the works program.

6 CERTIFICATION

This Review of Environmental Factors (REF) examined and takes into account all matters likely affecting the environment as a result of the Proposal and details the environmental safeguards to be implemented as part of the Proposal that will mitigate the potential environmental impacts.

The assessment has concluded that the Proposal as described in this REF, providing all proposed management measures and safeguards are implemented, is not likely to result in a significant impact on the environment.

The Proposal is not likely to result in a significant impact on any declared critical habitat, threatened species, populations or ecological communities or their habitats. Therefore, a Species Impact Statement (SIS) and / or participation in the Biodiversity Offset Scheme is not required.

The Proposal is not being carried out on Commonwealth land, is unlikely to affect any Commonwealth land, or have any significant impact on any Matters of National Environmental Significance.

All proposed work contemplated as part of the Proposal will be completed under the guidance of a Construction Environmental Management Plan (CEMP) to manage and minimise potential environmental impacts, particularly ecological impacts, associated with the proposed work. Once operational, the Proposal is not expected to cause any significant environmental or community impacts.

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DPI 2021 Weeds of National Significance [NSW WeedWise](#)

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8 APPENDICES

Appendix	Item
Appendix A	Design Drawings
Appendix B	Flora and Fauna Assessment
Appendix C	Aboriginal Due Diligence Assessment
Appendix D	Summary of Environmental Safeguards

Appendix A – Design Drawings

Appendix B – Flora and Fauna Assessment

APPENDIX B: FLORA AND FAUNA ASSESSMENT – Glen Davis Road Bridge Replacement

Capertee and Glen Davis, NSW
Prepared for: Lithgow City Council



Flora and Fauna Assessment – Glen Davis Road Bridge Replacements

Document Verification

Revision	Author/s	Review	Date submitted	Client Review and Approval	
				Name	Date
0.1	Anna Uhrig, J Sanderson	S Rivett	7/12/2021	Sean Quick	29/09/2021
1.0	A Uhrig, J Sanderson	S Rivett	10/12/2021		

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This Report has been prepared by The Environmental Factor (TEF) at the request of Lithgow City Council (LCC or Council) to assess the matters affecting or likely to affect the environment by reason of the proposed replacement of three (3) bridges on Glen Davis Road between Capertee and Glen Davis, NSW. The purpose of this report is to document the biodiversity assets found on site, and to assess those that are likely to be impacted either directly or indirectly as a result of project delivery, to support a Review of Environmental Factors (REF) to be prepared for these works.

This document is not intended to be utilised or relied upon by any persons other than LCC and their appointed contractors nor to be used for any purpose other than that articulated above. Accordingly, TEF accepts no responsibility in any way whatsoever for the use of this report by any other persons or for any other purpose.

The information, statements, recommendations, and commentary (together the “Information”) contained in this review have been prepared by TEF on the basis of information provided by LCC (and appointed contractors) and from material provided the NSW Department of Planning, Infrastructure and Environment (DPIE) and the Commonwealth Department of Agriculture, Water and the Environment (DAWE) and through the survey process. TEF has not sought any independent confirmation of the reliability, accuracy or completeness of this information. It should not be construed that TEF has carried out any form of audit of the information which has been relied upon.



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Abbreviations

Abbreviation	Description
APZ	Asset Protection Zone
AOBV	Areas of Outstanding Biodiversity Value
BAM	Biodiversity Assessment Methodology
BC Act	<i>Biodiversity Conservation Act 2016</i>
BOS	Biodiversity Offset Scheme
CEEC	Critically Endangered Ecological Community
CEMP	Construction Environmental Management Plan
DEE	Department of Environment and Energy
DPI	Department of Primary Industries
EEC	Endangered Ecological Community
EPA	Environmental Protection Agency
EPBC Act	<i>Environmental Protection and Biodiversity Conservation Act 1999</i>
FFA	Flora and Fauna Assessment
FM Act	<i>Fisheries Management Act 1994</i>
HTE	High Threat Exotic
LCC	Lithgow City Council
LEP	Local Environment Plan
MNES	Matters of National Environmental Significance
NSW	New South Wales
OEH	Office of Environment and Heritage
PAD	<i>Potential Archaeological Artefacts</i>
POEO Act	<i>Protection of the Environment Operations Act 1997</i>
TBC	To be confirmed
TEF	The Environmental Factor
WoNS	Weed of National Significance

EXECUTIVE SUMMARY

The Environmental Factor (TEF) was commissioned by Lithgow City Council (LCC or Council) to prepare a Flora and Fauna Assessment (FFA) to assess the ecological constraints and significance of the potential ecological impacts associated the proposed removal of three (3) timber bridges and replacement with concrete structure bridges along Glen Davis Road between the townships of Capertee and Glen Davis, NSW. The bridges are located at the Airly Creek, Coco Creek and Crown Creek crossings, NSW (hereafter 'the Proposal').

The Proposal consists of removing three (3) existing timber bridges that are reaching the end of their operational life and replacing them with modern concrete structures. This will result in reduced long-term Council expenditure on maintenance, and increased road user safety. Since Crown Creek crossing has the potential for a diversion road around to the northern side of the bridge, it is expected that road closures will only be required for works at Coco creek crossing during which time the residents and visitors to the area would be required to detour via the Castlereagh Highway and Glen Alice Road through the township of Kandos. Council has identified a traffic diversion route for the Airly Creek Bridge works. This route travels along an existing road reserve and Council will liase with Centennial Coal for use of and risk management of this diversion. This diversion is only suitable for light vehicles (under 4.5t gvm and less than 3.5 m clearance) and any potential associated impacts have not been assessed herein.

Ground-truthed vegetation occurring within the subject site is shown in Table 1 below.

Table 1 Summary of native vegetation ground-truthed communities occurring within subject sites and study areas

Vegetation type	Site	Subject Site (ha)	Study area (ha)
<i>PCT 0 – Non native</i>	Coco	0.001	1.19
<i>PCT 85 River Oak forest and woodland wetland of the NSW South Western Slopes and South Eastern Highlands Bioregion (no associated TEC).</i>	Coco	0.12	1.76
<i>PCT 268 White Box - Blakely's Red Gum - Long-leaved Box - Nortons Box - Red Stringybark grass-shrub woodland on shallow soils on hills in the NSW South Western Slopes Bioregion (has associated TEC)</i>	Airly	0.09	0.64
	Coco	0.03	2.02
	Total	0.12	2.66
<i>PCT 281 Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion (has associated TEC)</i>	Crown	0.22	4.85
<i>PCT 323 Red Stringybark - Inland Scribbly Gum open forest on steep hills in the Mudgee - northern section of the NSW South Western Slopes Bioregion (no associated TEC).</i>	Airly	0.05	4.16

Vegetation type	Site	Subject Site (ha)	Study area (ha)
Total Native	All sites	0.51	13.44

The following ecological impacts area associated with the Proposal based on the current design (see REF).

- Total impact area of **13.44 ha** across all three (3) sites, with clearing of up to **0.51 ha** of native vegetation, including some mature trees.
- Total potential impacts to the TEC *White Box-Yellow Box-Blakely's Red Gum Woodland and Derived Grassland*, listed as critically endangered under both the BC and EPBC Act of **7.51 ha** including direct impacts of approximately **0.34 ha** and indirect impacts to a further **7.17 ha** across all three (3) sites.
- Potential impacts to five (5) immature Capertee Stringybark (*Eucalyptus cannonii*) listed as Vulnerable under the BC Act at Airly Creek subject site, with further individuals recorded within the study area with potential for indirect impacts.
- Potential direct impact to two (2) mature habitat trees (one (1) at Airly Creek and one (1) at Crown Creek) along with other smaller trees, stags, logs and the bridge structures themselves, providing potential habitat for fauna including microbats, woodland birds and arboreal fauna.
- Direct impact to three (3) waterways during construction of the new bridges including impact to fringing aquatic vegetation, rock pools and other aquatic habitat, requiring a Fisheries permit.
- Indirect impacts to flora and fauna, including threatened species, occurring within the study area through noise and activity disturbance.
- Potential injury or mortality of small, terrestrial and aquatic fauna within the Proposal footprint.

Flora and fauna surveys, including habitat assessments and incidental flora and fauna recordings were completed during the site visit to identify important habitat components for any threatened species and ecological communities recorded, or that may occur, within the locality. Based on the desktop assessment, site visit, targeted surveys and habitat assessments undertaken, thirty-two (32) threatened species and one (1) TEC were considered as having the potential to be impacted as a result of the proposal, including thirty (30) species listed under the BC Act and seven (7) listed under the EPBC Act, with the TEC listed under both, as follows:

- Booroolong Frog, (*Litoria booroolongensis*) – E (BC and EPBC Act)
- Stuttering Frog, (*Mixophyes balbus*) – E (BC Act), V (EPBC Act)
- Woodland Birds – fifteen (15) listed as V (BC Act), one (1) as E (BC Act) and (1) as CE (BC Act). Two (2) species listed as CE (EPBC Act) and one as V (EPBC Act).
- Six species of bat and three species of owl, all listed as V (BC Act)
- Greater glider, (*Petauroides volans*) listed as V (EPBC Act)

- Spotted-tailed quoll, (*Dasyurus maculatus*)– V (BC Act), E (EPBC Act)
- Capertee stringybark, (*Eucalyptus cannonii*) – V (BC Act)
- *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* – CE (BC and EPBC Act).

Tests of significance for the above species were prepared in accordance with Section 1.7 of the EP&A Act and the EPBC Act *Matters of National Environmental Significance – Significant Impact Criteria Guidelines* (DEWHA, 2009). These assessments have concluded that the Proposal is unlikely to have a significant negative effect on the threatened species occurring within the impact footprint. Therefore, Species Impact Statements and / or Referral to the Environment Minister are not required for this project.

Mitigation measures proposed for these works include those relating specifically to instream works, erosion and runoff control and protection of sensitive aquatic and riparian habitats. Ensuring vegetation clearing is restricted to pre-specified areas only, timing of clearing outside of key breeding times for species present, erection of sediment and erosion control, stockpiling and earthworks in line with Bluebook requirements, and adherence to strict hygiene procedures are some of the proposed mitigation measures for this proposal. Two mature trees occurring within the Airly Creek and Crown Creek subject sites are recommended to be retained through project planning.

1 INTRODUCTION

1.1 Overview

The Environmental Factor (TEF) was commissioned by Lithgow City Council (LCC or Council) to prepare a Flora and Fauna Assessment (FFA) to assess the ecological constraints and significance of potential ecological impacts associated with the proposed removal of three (3) timber bridges and replacement with concrete bridge structures along Glen Davis Road between the townships of Capertee and Glen Davis, NSW. The bridges are located at the Airly Creek, Coco Creek and Crown Creek crossings, Glen Davis NSW (hereafter 'the Proposal').

The Proposal consists of removing the three (3) timber bridges that are reaching the end of their operational life and replacing them with modern concrete structures. This will result in reduced long-term Council expenditure on maintenance, and increased road user safety. Construction of the three (3) new bridges will require the closure of Glen Davis Road on one occasion to accommodate bridge removal and reconstruction of replacement bridge at Coco Creek location, during which time the residents and visitors to the area would be required to detour via Glen Alice Road through the township of Kandos. Diversions have been planned for Crown and Airly Creek bridges.

The FFA has been prepared to assess the potential for impacts on ecological values, with particular emphasis on threatened ecological communities, populations and species listed under the *NSW Biodiversity Conservation Act 2016* (BC Act) and Matters of National Environmental Significance (MNES) listed under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The FFA has been undertaken in accordance with the *Environmental Planning and Assessment Act 1979* (EP&A Act) and the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation). The Proposal is being determined under Part 5 Section 1.7 of the EP&A Act via a separate Review of Environmental Factors (REF), which this report will support.

1.2 Terms and definitions

The terms described in Table 2 are used in this report.

Table 2 Definitions

Term	Description
Subject site	<p>The maximum area to be directly affected by the Proposal, including earthworks, in-stream works and vegetation clearing. Includes:</p> <ul style="list-style-type: none"> Airly Creek crossing: 67 m by 25 m area Coco Creek crossing: 76 m by 25 m area Crown Creek crossing: 68 m by 38 m area <p>A total combined area of 0.51 ha (Figure 1).</p>
Study area	<p>Includes the subject site (as described above) and any proximal areas that could be potentially directly or indirectly impacted by the Proposal. For the purposes of this report the study area has included a buffer area of 100 m either side of the centre line of the bridge. Measuring a cumulative 14.63 ha of which native vegetation equals 13.44 ha (Figure 1).</p>
Locality	<p>Is the area within 10 kilometres of the subject site (Figure 2).</p>

1.3 Proposal description

The Proposal, as assessed herein, consists of removing the existing timber bridge structures crossing Airly Creek, Coco Creek and Crown Creek, and replacing the bridges with modern concrete bridge structures along Glen Davis Road between the townships of Capertee and Glen Davis. The study area is broken up into three sections, defined by the creek crossing on Glen Davis Road. The bridges are identified as follows:

- i) Airly Creek – located approximately 3.8 km northeast along Glen Davis Road from the township of Capertee within the road reserve, between crown land Lot 7001 DP 1029380 and Lot 7002 DP 10219380
- ii) Coco Creek – located approximately 16.4 km east along Glen Davis Road from the township of Capertee within the road reserve, between freehold Lot 1 DP 568768 and Lot 100 DP 1007747
- iii) Crown Creek – Located approximately 19.6 km east along Glen Davis Road from the township of Capertee within the road reserve, between freehold Lot 4 DP 249092 and Lot 5 DP 248232

The bridges were constructed during the early 1940s and are approaching the end of their operational life. Extensive maintenance works, including the replacement of structural components was last undertaken in the 1980s and is now required again. Furthermore, Council invests approximately \$120,000 per annum into the bridges in general maintenance costs. The single lane design of the bridges is considered a safety risk, as Glen Davis Road is a designated heavy vehicle route, speed limited at 100km/h. The proposed replacement design will widen the bridges to accommodate two lanes of traffic and a footpath (from 5.5 m to approximately 8.5 m width). The replacement design will also be constructed from reinforced concrete segments to maximise the asset's life, reduce maintenance costs, and meet current engineering standards.

Council has received grant funding from Transport for NSW (TFNSW) to replace the bridges, together with three other Councils. The four Councils have engaged a procurement consultant to approach the market for the design and construction components as a joint approach.

Construction duration for each bridge is expected to be approximately ten (10) to thirteen (13) weeks, during which time Glen Davis Road will require closure on at least one (1) occasion to accommodate the removal of existing infrastructure and reconstruction of replacement bridges. During which time the residents and visitors to the area would be required to detour via Castlereagh Highway and Glen Alice Road through the township of Kandos. Council is considering the feasibility of installing a temporary bridge diversion at the Crown Creek crossing for local residents, which would involve establishing a single lane access road around the north side of the bridge by expanding an existing access road, placing and compacting fill, and installing temporary culverts within the river crossing. Council has also identified a traffic diversion route for the Airly Creek Bridge works that is only suitable for light vehicles (under 4.5t gvm and less than 3.5 m clearance). This route travels along an existing road reserve, with Council to liaise with Centennial Coal for use and risk management of this diversion.

Detailed design of the replacement bridges is currently underway and, once finalized, will include definitive construction methodology and footprint areas including laydown, parking, and stockpile areas. Given the need to close the road during construction for at least one (1) of the bridge demolition

/ construction sites, and the absence of space on the road shoulders, it is anticipated that parking and stockpile sites will be placed on the existing roadway.

A temporary construction impact footprint around each bridge of 10 m either side of the centre line of the bridge has been nominated to allow for the movement of construction machinery, and alteration to the riverbed up and down stream. This direct impact zone (the subject site) has a 100 m indirect impact area applied (the study area). Concept drawings have been included as Appendix A in the project REF.

It is proposed that typical bridge demolition machinery and auxiliary equipment will be used throughout the proposed removal of the three (3) timber bridges. Likewise, the proposed construction of the new bridges would involve typical construction machinery and methodology for each aspect, respectively. The number of personnel on the site will vary depending on the phase of demolition / construction. The Proposal would involve piling for the replacement bridge foundations in and / or around the water body and installing the bridges substructure, deck and superstructure, predominantly by lifting precast material into place. Heavy machinery would include an excavator with drilling attachments for piling, a crane to lift bridge segments into place, and dump trucks for delivering / removing spoil.

1.4 Aims and scope of this report

The aims of this assessment are to:

- Identify the presence or likely presence of threatened species, populations and ecological communities and their habitats listed under the BC Act.
- Identify the potential for any Matters of National Environmental Significance (MNES) listed under the EPBC Act to occur within the Proposal footprint and/or to be indirectly impacted by the Proposal.
- Identify the potential impacts of the Proposal on threatened biota or migratory species and their habitats.
- Recommend mitigation and environmental management measures to avoid or minimise adverse impacts on threatened biota and biodiversity values, as appropriate, to facilitate the relevant planning approvals process.
- Assess the significance of impacts on threatened biota listed under the BC Act and identify the likely requirement or otherwise for further assessment and approvals under the EP&A Act.
- Assess the significance of impacts on MNES and identify the likely requirement or otherwise for further assessment and approvals under the EPBC Act.

The results of this assessment indicate whether the Proponent undertaking the development needs to complete a Species Impact Statement (SIS) for impacts to species or communities protected under NSW legislation, or a referral to the Minister for Environment (EPBC Act) for impacts to MNES, prior to determination of the Proposal through completion of the project Review of Environmental Factors (REF).

The conclusions of this assessment are provided in Section 6 of this report.

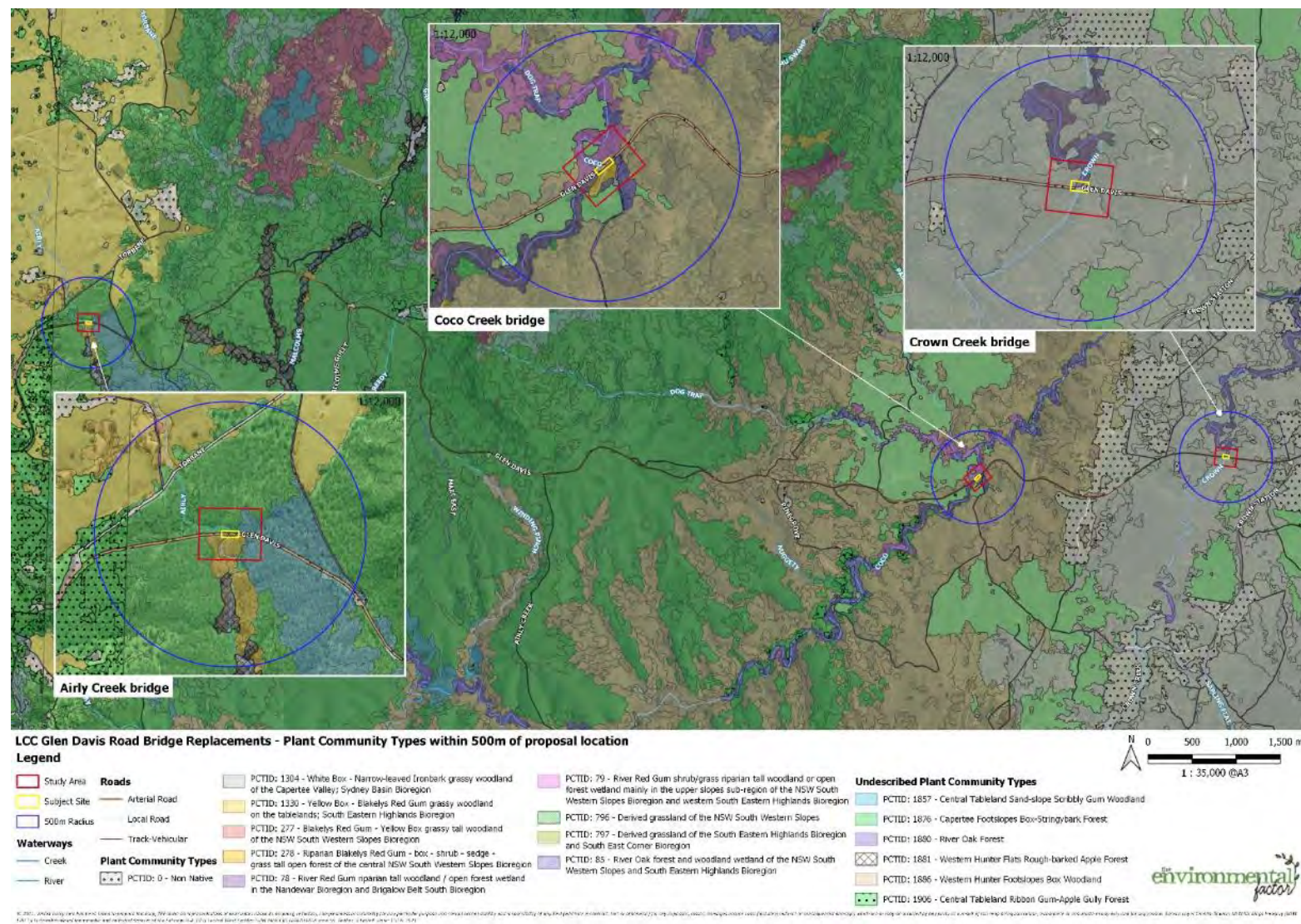


Figure 1 Subject site with mapped PCT's and Waterways

2 LEGISLATIVE CONTEXT

2.1 NSW State Legislation

2.1.1 Environmental Planning and Assessment Act 1979 (EP&A Act)

The *Environmental Planning and Assessment Act 1979* (EP&A Act) forms the legal and policy platform for proposal assessment and approval in NSW and aims to, inter alia, 'encourage the proper management, development and conservation of natural and artificial resources'. All development in NSW is assessed in accordance with the provisions of the EP&A Act and EP&A Regulation 2000. In addition, Section 5.5 of the Act states that the determining authority must consider the effect of an activity on:

- Areas of Outstanding Biodiversity Value (AOBV) (as defined under the BC Act).
- Species, populations or ecological communities, or their habitats (as listed under the BC Act) and whether there is likely to be a 'significant effect' on those species, populations or ecological communities.
- Other protected fauna or protected native plants listed under the National Parks and Wildlife Act 1974.

Section 1.7 of the EP&A Act lists factors that must be considered in the determination of the significance of potential impacts of a proposed activity on threatened species, populations or ecological communities (or their habitats) listed under the BC Act and the FM Act. This Test of Significance is used to assist in the determination of whether a Proposal is 'likely' to impose 'a significant effect' on threatened biota and thus whether a species impact statement (SIS) is required. Section 1.7 of the EP&A Act was addressed as part of the current assessment and tests of significance were completed for relevant threatened species and ecological communities that are likely to be affected by the Proposal. These assessments are included as Appendix E and Appendix F

2.1.2 Biodiversity Conservation Act 2016 (BC Act)

Section 7.2 and 7.8 of the *Biodiversity Conservation Act 2016* (BC Act) states that the determining authority must consider the effect of an activity on

- Areas of Outstanding Biodiversity Value (AOBV), and/or
- Species, populations or ecological communities, or their habitats and whether there is likely to be a 'significant effect' on those species, populations or ecological communities.

The BC Act provides legal status for biota of conservation significance in NSW. It provides a framework for the Biodiversity Assessment Method (BAM) and the calculation of offset requirements for projects participating in the Biodiversity Offset Scheme (BOS).

The BC Act aims to:

- Conserve biological diversity on a bioregional and state scale
- Lists Areas of Outstanding Biodiversity Value (AOBV)
- Assess the extinction risk of species and ecological communities
- Identify Key Threatening Processes
- Slow the rate of biodiversity loss, and conserve threatened species

2.2 Biodiversity Conservation Regulatory Act 2017 (BC Regulatory Act)

The *Biodiversity Conservation Regulation 2017* provides a number of considerations and practices to be implemented as part of the BC Act, as follows:

- Identifies clearing thresholds and the Biodiversity Values Map for the application of the Biodiversity Offsets Scheme (BOS),
- Outlines principles for serious and irreversible impacts (SRI) to biodiversity,
- Rules for meeting biodiversity offset obligations, and
- Biodiversity certification criteria.

The Proposal is being assessed under Part 5 of the EP&A Act, consequently Council is exempt from compulsory participation and can elect to voluntarily participate in the Biodiversity Offset Scheme if desirable. LCC have elected not to voluntarily participate in the Biodiversity Offset Scheme.

The Biodiversity Values Map includes high biodiversity value lands along the riparian corridors of Airly Creek, Coco Creek, and Crown Creek within the study areas of the Proposal, (search date 16/08/2021).

Area Criteria Threshold

Native vegetation clearing thresholds as outlined in Part 7 of the *Biodiversity Conservation Regulation 2017* (Table 3) indicates when a project would need to enter the BOS according to the below minimum lot sizes and the corresponding native clearing thresholds.

Table 3 Area criteria – Biodiversity Offset Scheme threshold

Minimum lot size	Threshold for clearing (ha) to enter BOS
<1 ha	>0.25
1 ha < 40 ha	>0.5
40 ha – 1000 ha	>1
>1000 ha	>2

The clearing thresholds for native vegetation will not be exceeded by this Proposal; therefore, participation in the BOS is not required.

Areas of Outstanding Biodiversity Value

The presence of listed Areas of Outstanding Biodiversity Value (BC Act) on site would require participation in the BOS. No listed AOBV occur on site.

2.2.1 NSW Biosecurity Act 2015 (Biosecurity Act)

The *NSW Biosecurity Act 2015* (Biosecurity Act) outlines mandatory measures that persons are to take with respect to biosecurity matters including the management of weeds (Part 2, Division 8 including Weeds of National Significance (WoNS)). Under the Biosecurity Act, the responsibilities for weed management by public and private landholders are consistent, reflecting that weed management is a shared community responsibility. The Act introduces the legally enforceable concept of a General

Biosecurity Duty (GBD). Priority weeds are listed within Regional Strategic Weed Management Plans, however the GBD is not restricted to listed weeds.

The Biosecurity Act is administered by NSW Department of Primary Industries which determines the weed species covered by regulatory tools including Prohibited Matters, Control Orders and Biosecurity Zones. Existing Local Control Authorities (Councils) continue to be responsible for enforcing weed legislation.

Priority weeds observed on site are outlined in Section 4.1.4

2.2.2 Fisheries Management Act 1994 (FM Act)

The objects of the *Fisheries Management Act 1994* (FM Act) are to conserve, develop and share the fishery resources of the State for the benefit of present and future generations. It provides for:

The listing of threatened species, populations and ecological communities, with endangered species, populations and communities listed under Schedule 4, 'critically endangered' species and communities listed under Schedule 4A, and vulnerable species and communities listed under Schedule 5.

- The listing of 'Key Threatening Processes' (under Schedule 6).
- Diseases affecting fish and marine vegetation (under Schedule 6B).
- Noxious fish and noxious marine vegetation (under Schedule 6C).
- The preparation and implementation of Recovery Plans and Threat Abatement Plans.
- Requirements or otherwise for the preparation of a SIS.

One of the objectives of the FM Act is to 'conserve key fish habitats ' which includes aquatic habitats that are important to the maintenance of fish populations generally and the survival and recovery of threatened aquatic species.

The FM Act has been addressed in the current assessment through undertaking:

- A desktop review to determine the threatened species, populations or ecological communities that have been previously recorded within the locality of the Proposal and hence could occur subject to the habitats present.
- Assessment of aquatic habitats during terrestrial field surveys.
- Assessment of impacts on aquatic habitats.
- Assessment of the potential for impacts on threatened species, populations and ecological communities listed under the Act.
- Identification of suitable impact mitigation and environmental management measures to avoid or mitigate impacts on the aquatic environment.

2.2.2.1 Policy and guidelines for fish habitat conservation and management (NSW DPI 2013)

The Policy and Guidelines for Fish Habitat Conservation and Management (2013) provides classification of Key Fish Habitats based on the characteristics of the waterway present.

Key Fish Habitats are further categorized according to 'sensitivity', with Type 1 containing Highly Sensitive habitat, Type 2 containing Moderately Sensitive habitats and Type 3 containing Minimally Sensitive habitats.

The bridge replacements occur at three (3) different creeks, Airly Creek, Coco Creek and Crown Creek and instream works will occur. A s200 Fisheries Permit will be required.

Table 4 Key Fish Habitat Waterway Classifications (NSW DPI 2013)

Classification	Characteristics of Waterway
Class 1 Major Key Fish Habitat	Marine or estuarine waterway or permanently flowing or flooded freshwater waterway (e.g. river or major creek), habitat of a threatened or protected fish species or 'critical habitat'.
Class 2 Moderate Key Fish Habitat	Non-permanently flowing (intermittent) stream, creek or waterway (generally named) with clearly defined bed and banks with semi-permanent to permanent waters in pools or in connected wetlands areas. Freshwater aquatic vegetation is present. Type 1 and 2 habitats present.
Class 3 Minimal Key Fish Habitat	Named or unnamed waterway with intermittent flow and sporadic refuge, breeding or feeding areas for aquatic fauna (e.g. fish, yabbies). Semi-permanent pools form within the waterway or adjacent wetlands after a rain event. Otherwise, any minor waterway that interconnects with wetlands or other Class 1-3 fish habitats.
Class 4 Unlikely Key Fish Habitat	Waterway (generally unnamed) with intermittent flow following rain events only, little or no defined drainage channel, little or no flow or free-standing water or pools post rain events (e.g. dry gullies or shallow floodplain depressions with no aquatic flora present).

2.2.3 Water Management Act 2000

The *Water Management Act 2000* (WM Act), administered by NSW Office of Water, is progressively being implemented throughout NSW to manage water resources, superseding the *Water Act 1912*. The aim of the WM Act is to ensure that water resources are conserved and properly managed for sustainable use, benefiting both present and future generations. It is also intended to provide formal means for the protection and enhancement of the environmental qualities of waterways and their in-stream uses as well as to provide for protection of catchment conditions.

2.2.4 NSW Guidelines for Controlled Activities on Waterfront Land (NOW, 2012)

Any works proposed within the defined riparian zone of a creek are to be carried out in accordance with the WM Act. Works undertaken on waterfront land (i.e. near a river, lake or estuary) require a *Controlled Activity Approval* under Section 91 of the WM Act, unless defined as exempt. The current works are being progressed by LCC and are considered exempt from requiring *Controlled Activity Approval* as LCC is a Local Government Authority.

NSW DPI Water guidelines recommend riparian buffer distances to protect and maintain water quality and habitat. Recommended buffer distances are tabled below (Table 4). Works are not to be carried out within the Total Riparian Zone as described below. Development which encroaches within these

riparian buffer distances are recommended to be offset using the 'averaging rule' outlined by NSW DPI Water.

Table 5 Riparian corridors based on stream order (NSW DPI)

Stream order	Vegetated Riparian Zone (each side of watercourse) (m)	Total Riparian Zone (m)
1st	10	20 + channel width
2nd	20	40 + channel width
3rd	30	60 + channel width
4th	40	80 + channel width

2.2.5 Local Land Services Act 2013 (LLS Act)

The *Local Land Services Act 2013* (LLS Act) includes the management of natural resources in the consideration of the principles of Ecological Sustainable Development (ESD).

Vegetation clearing provisions are considered under Part 5A of the LLS Act. The LLS Act regulates the clearing of native vegetation on all land in NSW mapped as Category 2 – Regulated Land as mapped on the Native Vegetation Regulatory Map. It does not include Excluded Land and Category 1 Exempt Land mapped on the Native Vegetation Regulatory Map.

Vegetation clearing which does not require development consent under the EP&A Act is considered for approval by the Native Vegetation Panel under the LLS Act.

2.2.6 Local Land Services Amendment Act 2016 (LLSA Act)

The *Local Land Services Amendment Act 2016* (LLSA Act), which amended the *Local Land Services Act 2013*, authorised the making of the Land Management (Native Vegetation) Code 2018 (Div 5, Sch 1 of the LLSA Act). The aim of the Code is to authorise clearing of native vegetation on Category 2 regulated land under certain conditions and provide for the establishment and maintenance of set aside areas.

Review of the Native Vegetation Regulatory map (report generated 10/03/21 Appendix A) confirmed that the study area occurs primarily on unmapped land with some areas of Vulnerable Regulated Land occurring along all three (3) of the creeks. However, under Division 3, 600 Clearing is authorised under Part 5. Therefore, this has not been considered further within this report.

2.3 State Environmental Planning Policies

2.3.1 Koala Habitat Protection SEPP

The State Environmental Planning Policy (Koala Habitat Protection) 2021 commenced on 17th of March 2021. The Koala SEPP 2021 reinstates the policy framework of SEPP Koala Habitat Protection 2019 to 83 Local Government Areas (LGA) in NSW, of which Lithgow LGA is included. The SEPP 2019 replaced SEPP 44, which was in force from 1995 through to 2019.

Generally, the provisions under the Koala SEPP also do not apply to activities being assessed under Division 5.1 of Part 5 of the EP&A Act. However, the Koala is listed as a Vulnerable species under the BC Act and EPBC Act, and thus also requires assessment under these Acts. This has been undertaken

in Section 4.2, and consideration of the SEPP has been given to assist with assessment of likelihood of impact arising from the Proposal, i.e. whether the area contains 'Potential' or 'Core' Koala habitat.

This SEPP does not apply to land dedicated or reserved under the National Parks and Wildlife Act 1974 or to land dedicated under the Forestry Act 2012 as a State forest or flora reserve.

- The development application requires clearance of an area of more than 1 hectare
- Or has, together with any adjoining land in the same ownership, an area of more than 1 hectare, whether or not the development application applies to the whole, or only part of the land.

This SEPP does not apply to land dedicated or reserved under the National Parks and Wildlife Act 1974 or to land dedicated under the Forestry Act 2012 as a State Forest or flora reserve.

Schedule 1 of the Koala Habitat Protection SEPP identifies local government areas (LGAs) to which SEPP applies. The proposed road upgrades occur in the City of Lithgow which is listed under Schedule 1. The 2021 SEPP does not apply to land zoned RU1, RU2 or RU3, unless it falls within the nine specified LGAs. As the study area falls within land mapped as RU2 (Airly Creek) and RU1 (Coco and Crown Creek), the SEPP 2021 does not apply, and the SEPP 2020 holds.

The SEPP requires that before granting consent for development on land over 1 hectare in area, a consent authority must be satisfied as to whether or not the land contains "Potential Koala habitat" or 'Core Koala habitat'.

- Core Koala habitat is defined as "an area of land with a resident population of koalas, evidenced by attributes such as breeding females, being females with young, and recent sightings of and historical records of a population".
- Potential Koala habitat means areas of native vegetation where trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component.

Where Core Koala habitat occurs, the Koala Habitat Protection SEPP requires that a Koala Plan of Management be prepared.

Koala records occur within a 10 km radius of the study area. Minor occurrences of Schedule 2 feed trees (*Eucalyptus albens*, Table 12), constituting less than 15 % of the upper or lower stratum of the site, occur within the study areas. No Koalas, or signs of recent habitat use (e.g. scratchings or scats) were observed during the limited onsite survey. Therefore, the site does not meet the criteria of "Potential Koala habitat" or 'Core Koala habitat' as defined under the SEPP.

The Likelihood of Occurrence Assessment concluded that the risk of impact to this species as a result of the proposed works is Low, therefore a Test of Significance has not been completed for Koala.

2.4 Commonwealth Legislation

2.4.1 *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*

The purpose of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is to ensure that actions likely to cause a significant impact on 'matters of national environmental significance' undergo an assessment and approval process. Under the EPBC Act, an action includes a project, a development, an undertaking, an activity or a series of activities, or an alteration of any of these things (DEWHA 2009). An action that 'has, will have or is likely to have a significant impact on a matter of national environmental significance' is deemed to be a 'controlled action' and may not be undertaken without prior approval from the Australian Government Minister for Sustainability, Environment, Water, Population and Communities (the 'Minister').

The EPBC Act identifies nine Matters of National Environmental Significance (MNES) as:

- World heritage properties.
- National heritage places.
- Wetlands of international importance (Ramsar wetlands).
- Threatened species and ecological communities.
- Migratory species.
- Commonwealth marine areas.
- The Great Barrier Reef Marine Park
- Nuclear actions (including uranium mining)
- A water resource, in relation to coal seam gas development and large coal mining development.

The EPBC Act has been addressed in the current assessment through:

- Desktop review to determine the MNES that are predicted to occur within the locality of the proposed scheme and hence could occur, subject to the habitats present.
- Targeted field surveys for threatened biota and migratory species listed under the Act.
- Identification of suitable impact mitigation and environmental management measures for threatened biota, where required.
- Assessment of potential impacts on MNES, if appropriate.

Potential impacts on relevant MNES must be subject to Tests of Significance pursuant to the EPBC Act Significant Impact Guidelines (DEWHA 2009). If a significant impact is considered likely, a referral under the EPBC Act must be submitted to the Commonwealth Environment Minister.

Significant Impact Criteria Assessments were completed for EPBC Act listed biota considered at risk of impact as part of the proposal (Appendix F).

3 METHODOLOGY

3.1 Desktop Review

A desktop assessment was undertaken to identify threatened flora and fauna species, populations and ecological communities listed under the BC Act, and MNES listed under the EPBC Act that may be affected by the Proposal. The results of the desktop assessment were then used to guide on-site field investigations.

3.1.1 Database searches

Database records pertaining to the site and locality (i.e. 10 kilometre radius) were reviewed and included:

- DPIE Wildlife Atlas database for records of threatened species and endangered ecological communities listed under the BC Act that have been recorded within the locality of the subject site (DPIE 2021, data accessed 27th August 2021).
- Department of the Environment and Energy (DEE) Protected Matters Search Tool for Matters of National Environmental Significance (MNES) listed under the EPBC Act recorded or predicted to occur in the locality of the site (DAWE 2021, report generated 27th August 2021).
- OEH threatened species profiles online database (DPIE 2021)
- DEE online species profiles and threats database (DAWE 2021).
- State Vegetation Type Map: Central Tablelands Region SMV PCT 4778 CRS GDA20 MGA zone 55, to identify native vegetation types occurring within the study area and the likely presence of any threatened ecological communities (OEH 2019).
- SEPP Koala Habitat Protection – SEPP 2020 applies

Following collation of database records and species and community profiles, a ‘likelihood of occurrence’ assessment was prepared with reference to the broad habitats contained within the subject site (Appendix D). The assessment was further refined following field surveys and assessment of habitat present.

3.1.2 Vegetation mapping

GIS mapping was completed prior to surveys being undertaken to inform ecologists of the habitats and vegetation likely to be on site and to provide a visual representation of mapped vegetation communities present within the study area, as well as any previous records of threatened species recorded.

3.2 Field survey

Two (2) TEF field ecologists completed an initial site visit on the 2nd of September 2021, accompanied by a LCC Representative, who provided TEF staff with an overview of the site and described works to be undertaken. Targeted frog surveys were undertaken by two (2) ecologists between 11th – 14th October 2021. A detailed summary of onsite investigation is detailed in Table 5.

Table 6 Survey effort summary

Survey method	Effort
Rapid data points	Rapid data points and random meander were undertaken opportunistically across the sites to verify PCT’s present and to develop a flora list within the study areas.

Survey method	Effort
Fauna habitat assessments	Habitat assessments were conducted across the site. Tree hollows, possible denning sites, leaf litter and other sites were inspected for their suitability as fauna habitat.
Opportunistic general surveys	Any fauna or flora seen on site was recorded.
Habitat tree and hollow assessment.	Mature trees with habitat features (hollows) were recorded using Avenza. These can be seen in Figure 3.
Aquatic Habitat assessment	Aquatic and riparian habitat was investigated to determine suitability for frog species and other fauna.
Targeted Frog Surveys	Aural-visual transects within creek lines across four (4) nights for a total of eight (8) hours of targeted frog surveys were undertaken at all three bridges, with the location of any threatened frog species marked with Avenza.

3.2.1 Terrestrial flora survey

Rapid Data Points

Numerous RDPs were completed within the subject site to determine the flora diversity and makeup within each vegetation zone. Points were chosen based on changes in vegetation structure and type, to develop a comprehensive species list for the project.

Vegetation mapping

GIS mapping was completed using QGIS prior to surveys being undertaken to provide a visual representation of vegetation communities present within the study area and any previous records of threatened species, historical sites or aboriginal artefacts recorded.

Opportunistic flora surveys

Trees and plants of significance, including potential threatened species and introduced plants or weeds, were targeted, and specimens retrieved, in order to create a positive ID and confirm their presence within the study area. Where plants of interest were seen, a sample (buds/nuts) was taken, and its location noted.

3.2.2 Terrestrial fauna survey

Habitat Tree and Hollow Assessment

Habitat tree and hollow assessments on site included active searches for the following habitat features:

- Trees with bird nests or other potential fauna roosts
- Rock outcrops or overhangs providing potential shelter sites for fauna
- Burrows, dens and warrens, bridges, culverts and hollow-bearing trees for evidence (e.g. guano or bat droppings) of roosting microbats. Particular attention was given to the bridge structures and the potential habitat associated with such structures (ie roosting bats).
- Hollow-bearing trees and logs which provide refuge, nest and den sites for a range of threatened fauna species

- Aquatic habitats including rock pools, creek lines and riparian vegetation
- Koala food trees and/or evidence of scratches or scats
- Distinctive scats or latrine sites, owl whitewash and regurgitated pellets under roost sites
- Tracks or animal remains
- Evidence of activity such as feeding scars, scratches and diggings
- Leaf litter and fallen timber were inspected for reptile habitat
- Presence of potential habitat for threatened frog species

Locations of important habitat features were recorded using Avenza and can be seen in Figure 2 - Figure 4.

Opportunistic observations

Opportunistic and incidental observations of fauna species were recorded at all times during field surveys; for instance, fallen timber was scanned for reptiles, rock fragments and logs were lifted to check for sheltering fauna and habitat trees and water bodies were scanned for roosting birds.

Targeted frog surveys

Nocturnal surveys for threatened frogs were undertaken at all three bridge locations. Frog surveys were completed on the 24th and 25th of November and the 1st and 2nd of December under appropriate conditions and following survey requirements for each targeted threatened species as described within the NSW Survey Guide for Threatened Frogs (DPIE, 2020). Aural-visual surveys were conducted within suitable habitat contained within the study area of the three sites over four nights, with call playback also undertaken for one species. Transects were walked along the stream bank of each creek with spotlights and calls used to detect the presence of threatened frog species within each site. Details of this are described in Table 7 and Figure 5.

Table 7 Targeted frog survey methodology

Target Species	Survey requirement BC Act / EPBC Act	Survey method	Effort
<i>Litoria booroolongensis</i> Booroolong Frog	<ul style="list-style-type: none"> – Oct - Dec (BC Act) – Survey Methods: Aural-visual surveys along stream edges: Spotlighting – Total effort for a 500 m transect: 480 minutes (adjusted for site size) – Number of repeat surveys: 4 	Targeted survey – Aural-visual survey transects on foot; Spotlighting	Four (4) targeted surveys over four (4) days. 100 m transect per site. Total of 160 minutes per site, equaling 480 minutes of survey undertaken.
<i>Mixophyes balbus</i> Stuttering Frog	<ul style="list-style-type: none"> – Sept – March (BC Act) – Aural-Visual surveys: 	Targeted survey – Aural Visual transect survey on	Four (4) targeted surveys over four (4) days. 100 m transect per site. Total of 160

Target Species	Survey requirement BC Act / EPBC Act	Survey method	Effort
	Spotlighting; Call playback – Total effort for a 500m transect: 480 minutes (adjusted for site size) – Number of repeat surveys: 4	foot; Spotlighting; Call playback	minutes per site, equaling 480 minutes of survey undertaken.

3.3 Likelihood of occurrence of threatened biota

The likelihood of occurrence assessment, started during the desktop assessment phase, was refined based on the results of the field survey. The likelihood of threatened biota occurring in the Proposal footprint was assessed based on presence of records from the locality, species distribution and habitat preferences, and the suitability of potential habitat present in the subject site. The results of this assessment are provided in Appendix D.

3.4 Tests of Significance of Impacts

Tests of the likely significance of impacts resulting from the Proposal have been prepared in accordance with Section 1.7 of the EP&A Act and the *Significant Impact Guidelines 1.1: Matters of National Environmental Significance* (DEWHA 2013) for threatened biota known or likely to occur within the Proposal footprint and with potential to be impacted by the Proposal, based on the results of the field survey. Assessments have only been undertaken for those species that may be impacted by the Proposal. These assessments are presented in Appendix E and Appendix F.

3.4.1 Survey conditions and limitations

Results from field investigations were influenced by timing and duration of surveys and weather conditions prior to, and during the surveys. Details of weather conditions recorded, and the limitations of the surveys undertaken, are outlined further below.

Survey conditions

During the survey period, conditions were partly cloudy, cool and calm, with a top of 20.4 degrees recorded on September 2nd at the Marrangaroo weather station (063308), the nearest weather station to the site. 0.2 mm of rain fell on the day of the site visit. Weather at the time of frog surveys (24/25th November and 1st, 2nd December) were generally fine (average 18 degrees) with clear to moderately cloudy skies and with rain falling earlier on each day. Further data on the weather conditions near the site on days preceding and following each survey are included as Appendix G. Note that conditions recorded at the closest weather station to the site (Marrangaroo) varied slightly from that recorded on site.

Survey limitations

Time restrictions, access and safety considerations on site meant that site surveys focused on broad habitat features and conditions rather than detailed analyses in the form of BAM plots. Areas containing potential TEC within the sites were located in areas not conducive to undertaking BAM

plots. Steep embankments, creek line and ecotones meant that BAM plot placement was not possible at Airly Creek. Crown Creek presented similar challenges, with a lack of continuous vegetation onsite, with most vegetation occurring in remnant slithers along fenceline or on private property.

Ecologists were able to walk the entire sites and survey flora within the subject sites; however, detailed observations outside the immediate impact footprint were not made in areas where access was restricted. This has limited the plant identification and subsequent Plant Community Type (PCT) determination opportunity within the broader study area.

Given the limited survey effort, it is likely that some species that occur in the study area either permanently, seasonally or transiently were not detected during the survey. These species may include annual, ephemeral or cryptic flora and fauna species; nocturnal fauna; birds and frogs which call at other times of year; and mobile or transient fauna in general. The brief habitat assessment conducted allows for identification of habitat resources for such species, in order to assess their likelihood of occurring within the study area. As such, the survey was not designed to detect all species, rather to provide an overall assessment of the ecological values within the Proposal footprint. This information was used to predict potential impacts of the Proposal on ecological values and to develop a design and/or mitigation measures to specifically avoid impacts on threatened ecological communities and known and potential habitat for threatened species, where practicable.

Due to the relatively small impact of the Proposal, survey efforts undertaken are deemed sufficient for the current assessment, and to allow for works to be undertaken.

4 RESULTS

The subject sites occur along a section of Glen Davis Road between Glen Davis and Capertee in NSW. The road is a narrow rural road with no shoulder in most sections. The bridges that form the subject sites are wooden and in need of upgrade due to their age. Glen Davis Road passes through two (2) State Conservation Areas (SCA's) with large patches of remnant native vegetation adjacent the road and a small number of private property entrances. The land to the north and south of all the bridges contains large tracts of remnant native vegetation, with over 22, 186 ha throughout Gardens of Stone National Park (south), Mugii Murum-ban State Conservation Area and Capertee National Park (north).

The majority of the study area is located on unmapped Land on the Native Vegetation Regulatory map (Appendix A). However, all three (3) creeks are mapped as Vulnerable Regulated Land.

4.1 Flora

4.1.1 Site description and vegetation communities

The vegetation communities mapped as present within the three study areas include: PCT 1330 *Yellow Box – Blakelys Red Gum grassy woodland on the tablelands*; PCT 1876 *Capertee Foothills Box-Stringybark Forest*; PCT 79 *River Red Gum shrub/grass riparian tall woodland or open forest wetland*; PCT 278 *Riparian Blakelys Red Gum – box – shrub – sedge – grass tall open forest*; PCT 1304 *White Box – Narrow-leaved Ironbark grassy woodland*; and PCT 78 *River Red Gum riparian tall woodland / open forest woodland*. The broader locality is dominated by native vegetation with large swathes of cleared agricultural land throughout (Figure 1). Some rubbish and weeds were found to occur in the roadside along Glen Davis Road.

Airly Creek bridge

The subject site of Airly Creek bridge contained intact and high-quality native vegetation surrounding the bridge with some annual weeds present along the roadside. The vegetation on site was found to most closely align with PCT 268 *White Box - Blakely's Red Gum - Long-leaved Box - Nortons Box - Red Stringybark grass-shrub woodland on shallow soils on hills in the NSW South Western Slopes Bioregion* which aligns with TEC - *White Box-Yellow Box-Blakely's Red Gum Woodland and Derived Grassland Critically Endangered Ecological Community (CEEC)* (see Section 4.3.1) based on the composition of species present.

Canopy species present within the subject site included *Eucalyptus macrorhyncha*, *E. goniocalyx* and *E. blakelyi*. *Eucalyptus cannonii* was possibly present within the southwestern corner of the subject site. Mid-storey strata species included *Acacia dealbata*, *A. implexa*, *Cassinia sifton*, *A. dawsonii*, *Hardenbergia violacea*, *Themeda australis*, *Acaena nova-zelandiae*, *Poa sp.*, *Geranium solanderi*, *Vittadinia cuneata*, *Lepidosperma laterale*, *Lomandra filliformis*, *Clematis aristata* and *Lomandra longifolia*.

The broader study area is mapped as containing PCTs 1330 and 1876, however surveys found that vegetation on site more closely aligns with PCT 323 *Red Stringybark - Inland Scribbly Gum open forest on steep hills in the Mudgee - northern section of the NSW South Western Slopes Bioregion* which occurred on elevated areas surrounding the site. The upper storey species consisted of *Eucalyptus rossii*, *E. macrorhyncha* and scattered *E. cannoni*. Midstorey species were similar to those in the subject site but also included *Acacia verniciflua*, *Lomatia silaifolia* and *Persoonia linearis*. Ground cover

species throughout the study area included *Lomandra multiflora*, *Lepidosperma laterale*, *Poa sieberiana*, *Hovea sp.*, *Gonocarpus tetragynus*, *Leucopogon muticus* and *Goodenia hederaceae*. The surrounding vegetation contained numerous habitat features including fallen timber, small and medium hollows, rocky outcrops and Airly creek as well as a nearby ephemeral creek located to the east of the site. Muggi Murrumbidgee SCA lies to the east of the Airly Creek bridge

The creekline and riparian zone at Airly Creek bridge contained large, open pools with rocky substrate and instream *Typha orientalis* with clear, flowing water. The creekline was concreted under the bridge and banks stabilised with concrete and rock within the subject site. Riparian vegetation south of the bridge consisted of *Poa sieberiana*, *Dianella revoluta*, *Bursaria spinosa*, *Lomandra longifolia* and weed species including *Solanum nigrum* and *Cirsium vulgare*. Vegetation along the northern side of the bridge was also very weedy and there was evidence of historic disturbance. *Phragmites australis* and *Poa labillardieri* was scattered throughout with a larger stand further upstream, with *Verbena rigida* and *Rubus fruticosus* also present.

Coco Creek bridge

The site at Coco Creek was dominated by a mixture of native and exotic vegetation along the creek line with evidence of clearing along the western side of the subject site.

Coco Creek contained clear, slow-moving water over a rocky base at the time of surveys with frog activity evident. The eastern bank of the creek was muddy and vegetated with *Angophora floribunda*, *Casuarina cunninghamiana*, *Lomandra longifolia*, *Melicytus dentatus*, *Bursaria spinosa*, *Adiantum aethiopicum* and *Dichondra repens* present along the stream bank. The western side was pebbly and dominated by *Casuarina cunninghamiana* with scattered *E. blakelyi*, *Lomandra longifolia* and *Melicytus dentatus* throughout.

The site contained scattered rubbish underneath the bridge, including old piping, discarded traffic cones and metal. The creek line itself was dominated by *Casuarina cunninghamiana* constituting PCT 85 River Oak forest and woodland wetland of the NSW South Western Slopes and South Eastern Highlands Bioregion.

Vegetation within the broader study area consisted of *E. goniocalyx*, *Angophora floribunda*, and scattered *E. blakelyi* with *Brachychiton populneus* also present. Mid storey species included *Bursaria spinosa*, *Acacia implexa* and *Hibbertia sp.* with the groundcover including *Adiantum aethiopicum*, *Geranium solanderi*, *Dichondra repens*, *Microlaena stipoides*, *Vittadinia cuneata* and weed species *Hypericum perforatum*, *Plantago lanceolata*, *Carthamus lanatus*, and *Rubus fruticosus*. This vegetation most closely aligns with PCT 268 White Box - Blakely's Red Gum - Long-leaved Box – Norton's Box - Red Stringybark grass-shrub woodland on shallow soils on hills in the NSW South Western Slopes Bioregion which aligns with the TEC White Box-Yellow Box-Blakely's Red Gum Woodland and Derived Grassland Critically Endangered Ecological Community (CEEC) (see Section 4.3.1.).

Crown Creek bridge

Crown Creek subject site contained small areas of regrowth native vegetation along the edges of the road with evidence of historic clearing most likely as a result of bridge repair works.

Crown Creek bridge vegetation contained regrowth canopy species *E. blakelyi*, *Brachychiton populneus*, *E. melliodora* and *Angophora floribunda* with midstory species including *Dodonea viscosa*, *Acacia subulata*, *A. paradoxa* and *A. decora* also present. Ground cover species consisted of *Themeda australis*, *Dichondra repens*, *Juncus usitatus*, *Microlaena stipoides* and *Typha orientalis* with a moderate to high density of weed species including *Hypericum perforatum*, *Carthamus lanatus*, *Hypochaeris radicata*, *Verbena ridiga*, *Rubus fruticosus* and *Solanum nigrum*.

Outside the subject site, vegetation on both sides of the creek north and south of the subject site was determined to most closely align with PCT 281 *Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion* with varying compositions of canopy species including *E. Blakelyi*, *E. melliodora*, *E. albens*, *E. sideroxylon*, *Callitris endlicheri*, *Brachychiton populneus*, *E. dealbata* and *Angophora floribunda* present. Midstory species included *Acacia subulata*, *A. implexa*, *Dodonea viscosa*, *A. paradoxa* and *Cassinia sp.* with *Lomandra longifolia*, *Lomandra filiformis*, *Hardenbergia violacea*, *Dichondra repens*, *Themeda triandra*, *Cymbopogon refractus*, *Glycine clandestina* and *Vittadinia cuneata* present in the ground layer.

The creek line was largely dominated by a mixture of native and exotic grasses with *Lomandra longifolia*, *Typha orientalis* and some weed species present throughout. Some small ponds and rocks were present to the north (upstream) and south (downstream) of the subject site with low levels of slow-moving water present during surveys.

Overall, the site had a mostly weedy ground cover with some native species present. Crown Creek was moderately degraded under the bridge, with the broader Study area containing habitat of greater quality.

Table 8 Summary of ground-truthed vegetation types within the study area

Vegetation type	Site	Subject Site (ha)	Study area (ha)
PCT 0 – Non native	Coco	0.001	1.19
PCT 85 River Oak forest and woodland wetland of the NSW South Western Slopes and South Eastern Highlands Bioregion (no associated TEC).	Coco	0.12	1.76
PCT 268 White Box - Blakely's Red Gum - Long-leaved Box - Nortons Box - Red Stringybark grass-shrub woodland on shallow soils on hills in the NSW South Western Slopes Bioregion (has associated TEC)	Airly	0.09	0.64
	Coco	0.03	2.02
	Total	0.12	2.66
PCT 281 Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion (has associated TEC)	Crown	0.22	4.85

Vegetation type	Site	Subject Site (ha)	Study area (ha)
PCT 323 Red Stringybark - Inland Scribbly Gum open forest on steep hills in the Mudgee - northern section of the NSW South Western Slopes Bioregion (no associated TEC).	Airly	0.05	4.16
Total Native	All sites	0.51	13.44



Plate 1 Airly Creek bridge with PCT 268 within the subject site.



Plate 2 Aquatic habitat and concreted channel under Airly bridge



Plate 3 PCT 323 within the Study Area of Airly Ck.



Plate 4 Airly Creek south of the subject site with surrounding vegetation and habitat features



Plate 5 Coco Creek bridge and surrounding vegetation – PCT 85.



Plate 6 Casuarina (PCT 85) directly adjacent Coco Creek bridge.



Plate 7 PCT 268 south of Coco Creek bridge



Plate 8 Coco Creek with rocky substrate and habitat



Plate 9 Crown Creek bridge and subject site showing PCT 281



Plate 10 PCT 281 within Crown Creek Study area



Plate 11 Crown Creek bridge with a predominately dry creek bed at time of survey (September 2021)



Plate 12 upstream pools of water, within the Crown Creek study area

4.1.2 Flora species

Sixty-eight (68) species of flora were recorded within the four (4) study areas, comprising 85% native to 15% exotic species. The full list of species recorded at each site during the current survey is presented in Appendix C.

No threatened flora species were recorded as occurring on the site. The vegetation present in the study area was in generally good condition with sections closest to the road showing signs of previous disturbance and weed encroachment. Trees containing hollows and stags suitable as native fauna habitat were present in varying quantities in each study area, though were largely absent or in low abundance within the subject sites (see Figure 2). Weed species were present at all sites, with higher percentage cover evident along the road edges and creek lines surrounding the bridges in areas of previous disturbance.

4.1.3 Declared and listed environmental weeds

Ten (10) species of exotics/weed were found occurring at differing levels across the study areas (see Appendix C for full list). Of these, two Priority weeds and / or Weed of National Significance (WoNS) were recorded during surveys in low - moderate density at all three (3) sites (Figure 2 - Figure 4).

Table 9 WONS and priority listed weeds for the Central Tablelands recorded within the study area

Scientific Name	Common Name	Control Category
<i>Hypericum perforatum</i>	St John's Wort	Priority Weed for the Central Tablelands
<i>Rubus fruticosus</i> spp. agg.	Blackberry	Weed of National Significance Priority Weed for Central Tablelands

4.2 Fauna

4.2.1 Fauna species

A total of twenty – eight (28) fauna species were recorded within the study areas during surveys. This included sixteen (16) bird species, six (6) frog species, one (1) reptile, one (1) crayfish, and four (4)

terrestrial mammal species. Common Wombat (*Vombatus ursinus*), Ringtail (*Pseudocheirus peregrinus*) and Brushtail (*Trichosurus vulpecula*) possums were observed at the Airly Creek site during nocturnal surveys, along with a number of various Macropod species adjacent to the subject site. A large number of Yabby (*Cherax destructor*) were also observed at Crown and Airly Creek during surveys with long-necked turtle (*Chelodina longicollis*) also present at Crown Creek. No other signs of fauna habitation were observed; however, fauna presence within the study areas is likely to be high considering the vast tracts of suitable habitat throughout the locality of each site.

4.2.2 Targeted Frog surveys

Two (2) threatened frog species were targeted (*Litoria boorolongensis* and *Mixophyes balbus*) during surveys, with none detected at any of the sites during the survey period. Species recorded during surveys can be seen in Table 10.

Table 10 Frog species recorded at each site during targeted surveys.

Species	Airly	Crown	Coco
	Creek water level moderate but not high and not turbid, low to moderate water flow	Creek water level low /gently running, humid.	Creek water level moderate to high, but not turbid, moderate speed of flow, debris on foliage from recent flooding.
<i>Crinia signifera</i>	x	x	x
<i>Crinia parasygnifera</i>	x	x	
<i>Limnodynastes dumerilii</i>	x	x	x (visual)
<i>Limnodynastes peronii</i>	x		
<i>Limnodynastes tasmaniensis</i>		x	
<i>Litoria caerulea</i>		x	
<i>Litoria lesueuri</i>			x (visual)
*x denotes aural observation			

4.2.3 Fauna habitat

Forty-three (43) species of threatened fauna have been recorded within the locality of the three sites (Figure 7). Each site and broader study area support a range of habitats for native wildlife and are largely surrounded by contiguous remnant vegetation with patches of cleared agricultural land which support the thoroughfare and habitation of a range of native woodland fauna species. Each of the subject sites contained minimal fauna habitat, with the most significant direct impact being to the creeks and some rocky outcrops and scattered regrowth vegetation. The bridges at all sites did not show any sign of fauna habitation (roosting animals, scats, nests etc). Habitat resources available

within the broader study areas included fallen logs, leaf litter, rocky outcrops, ephemeral creek lines, rocky pools, hollows, stags, and structurally diverse vegetation offering potential suitable nesting, foraging and sheltering sites for a range of fauna species including reptiles, amphibians, birds and small mammals. Potential fauna habitat observed within the subject sites and study areas can be seen in Plate 14 - Plate 22.

The main disturbances for fauna observed in the study area consisted of vehicles travelling along Glen Davis Road which is the only road passing through the vast tracts of native habitat, with roadkill noted along the road at the time of surveys. Site specific fauna habitat detail is presented below.

Airly Creek bridge

Airly Creek subject site included fauna habitat within the creek itself, with one hollow bearing tree present within the subject site that is recommended to be retained (Figure 2). Habitat within the study area was of high quality and consisted of fallen timber, small to medium sized hollows for birds and marsupials, rocky outcrops and a healthy waterway. Rock pools occur to the north and south of the subject site (Plate 14). A healthy riparian zone constitutes potential suitable habitat for frogs and other aquatic and amphibious fauna. The bridge itself provides potential roosting/ shelter habitat for birds and bats, though no evidence of fauna habitation was noted during surveys. Rocky slopes and outcrop to the north and south of the bridge provide potential sheltering and foraging habitat for reptiles and birds.

Coco Creek bridge

The fauna habitat resources within the Coco Creek subject site were minimal, with the creek itself containing some snags and timber and regrowth vegetation constituting potential habitat. One mature tree within the subject site will be impacted through limb trimming, however will not be removed.

The fauna habitat within the surrounding study area was in moderate overall condition. Fallen timber was found throughout the subject site along the creek line, providing potential habitat for reptiles, small mammals and foraging resources for birds. Coco Creek has a rocky stream bed with rock pools and instream roots, snags and riparian vegetation, with cobbles providing potential quality frog habitat. Some hollows occurred in vegetation adjacent to the subject site with six (6) medium sized trees recorded within the study area (Figure 3). A wombat burrow was located to the north of the site. Approximately forty-five (45) regrowth Casuarina stems occurring within the subject site and ranging in size from 2 – 18 cm diameter breast height (DBH) will be removed.

Crown Creek bridge

The Crown Creek subject site was degraded, with past impacts resulting in a lack of remnant native vegetation remaining within the subject site. The creek bed was dry, containing grasses and weeds, with limited suitable fauna habitat. Native overstory regrowth and shrubs occurred along the roadside with up to twenty-four (24) stems to 15 cm DBH recorded within the subject site roadside. The creek line and area surrounding the bridge were mostly in degraded condition. One large Eucalypt (*E. melliodora*) habitat tree, with a DBH of 88 cm, occurs within the subject site, where the temporary road diversion has been proposed (Figure 4). This tree provides important habitat resources, and it is recommended that it be retained.

The broader study area contained a variety of habitat features including hollows, good quality native vegetation, fallen timber, logs and shaded pools with aquatic vegetation and snags.



Plate 13 Habitat trees at Airly (left) and Crown (right) Creeks recommended for retention



Plate 14 Pool to the north of Airly Creek study area



Plate 15 Underside of Airly Creek bridge – potential roost for bats.



Plate 16 Rocky outcrop and slope to the north of Airly Creek bridge – potential fauna habitat.



Plate 17 Waterways and rock pool habitat feature under Coco Creek bridge.



Plate 18 Wombat burrow to the north of Coco Creek bridge.



Plate 19 Snags and timber within Coco Creek



Plate 20 Discarded rubbish within Coco Creek



Plate 21 Crown Creek - dead wood within study area



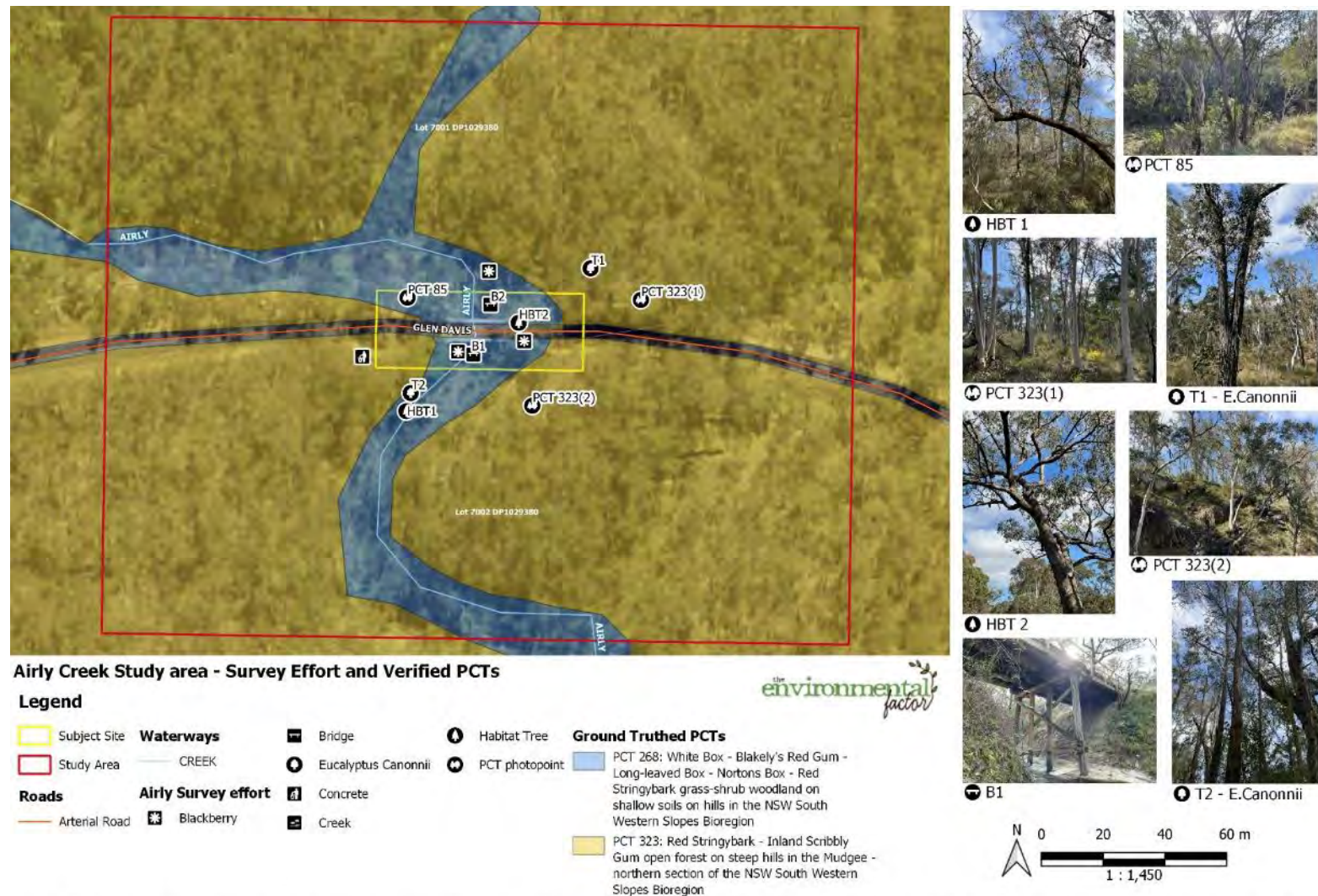
Plate 22 Swampy pools in Crown Creek study area



Plate 23 *Litoria leseuri* – found at Coco Creek during targeted surveys

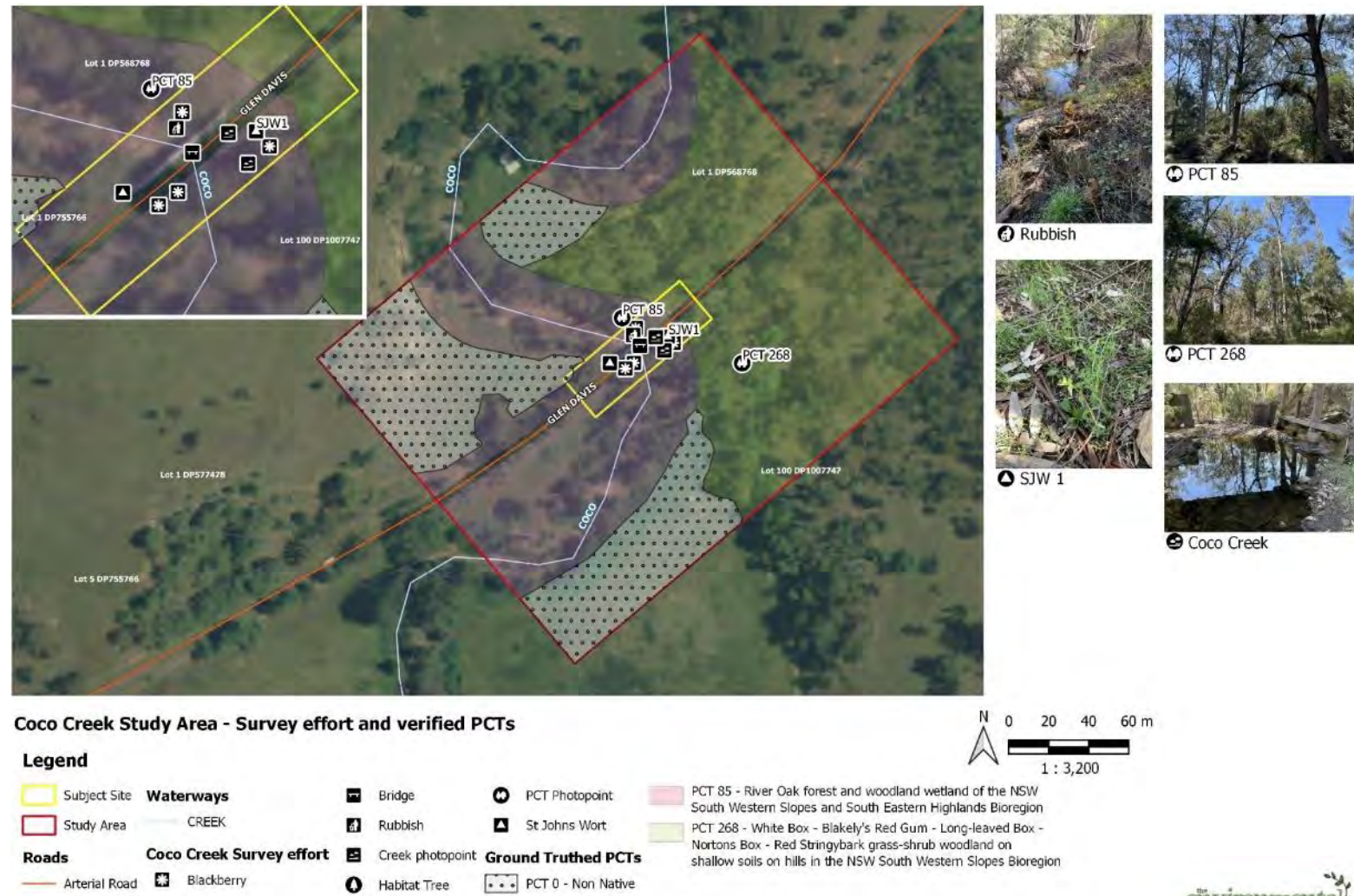


Plate 24 Targeted surveys for Booroolong Frog (*Litoria booroolongensis*) and Stuttering Frog (*Mixophyes balbus*)



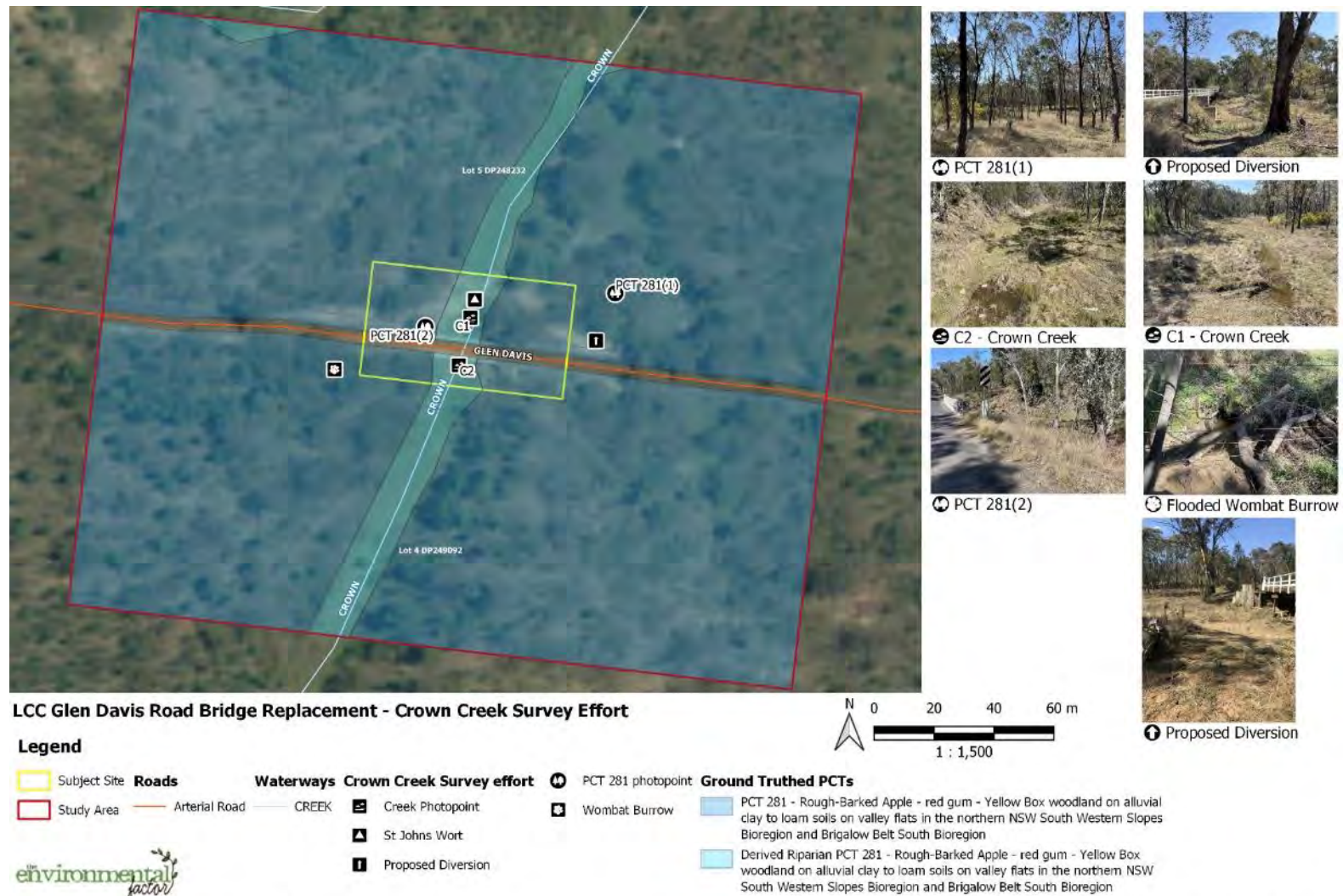
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Figure 2 Survey effort at Airly Creek including HBT features



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Figure 3 Survey effort at Coco Creek including HBT features



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Figure 4 Survey effort at Crown Creek including HBT features

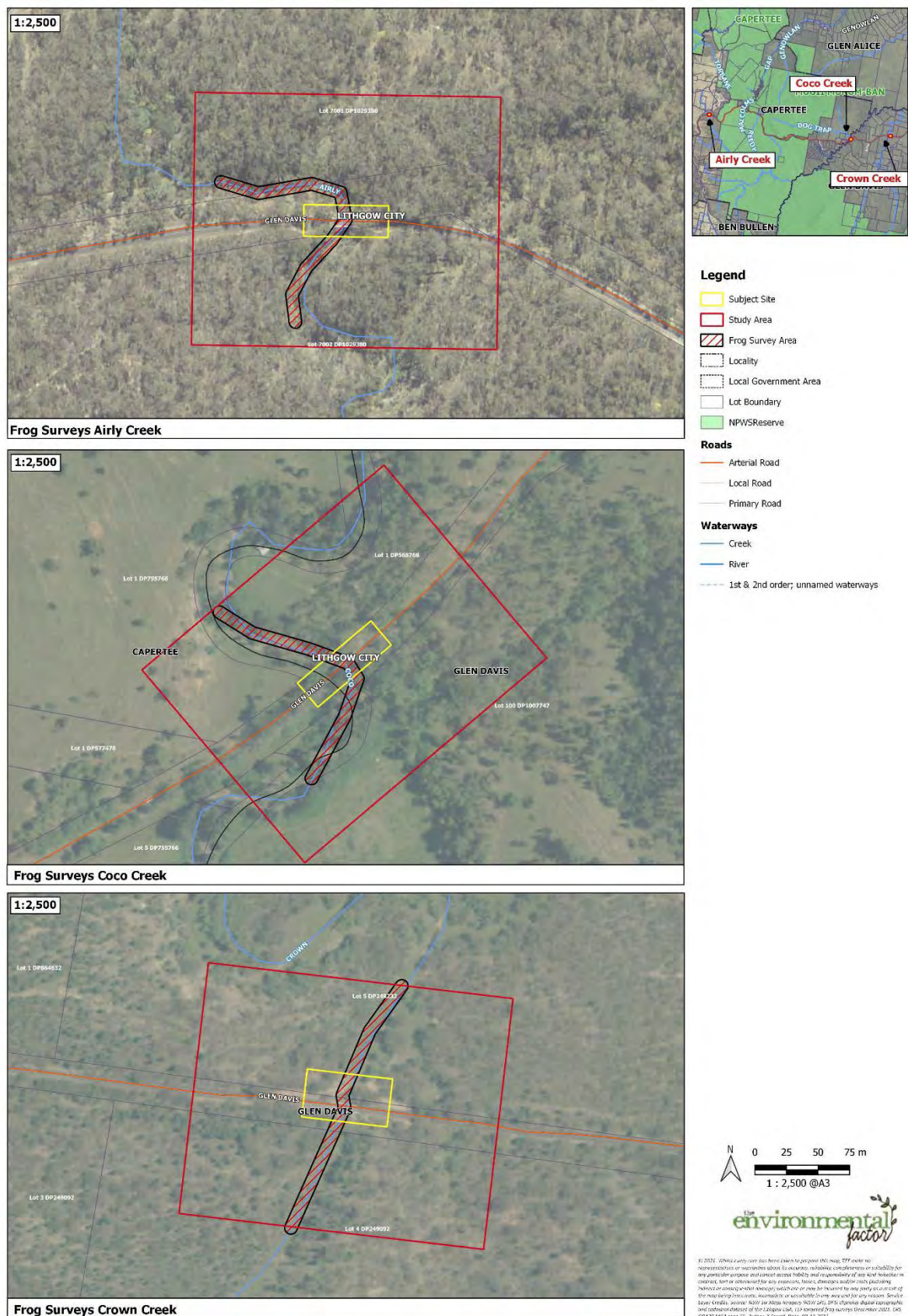


Figure 5 Frog survey effort

4.3 Conservation significance

4.3.1 Threatened ecological communities

One (1) Threatened Ecological Community (TEC) was confirmed as occurring within the study areas:

- *White Box-Yellow Box-Blakely's Red Gum Woodland and Derived Grassland*, listed as critically endangered under both the BC and EPBC Act

PCT's 268 and 281 present within the subject sites/ study areas conform to this TEC, representing an area of 7.51 ha across the study areas of all three (3) sites (see Table 11 for breakdown of areas). This TEC was in a moderate condition within the Airly Creek site and study area, with regrowth patches present within the Crown Creek subject site leading to a more patchy and degraded form on this site.

Table 11 PCT's corresponding to TEC within the subject sites and study areas

	<i>Airly 268 (ha)</i>	<i>Crown 281 (ha)</i>	<i>Coco 268 (ha)</i>	<i>All sites</i>
TEC direct	0.09	0.2224	0.0303	0.3427
TEC indirect	0.5531	4.62277	1.9945	7.17037
Total TEC	0.6431	4.84517	2.0248	7.51307

4.3.2 Threatened species

No threatened fauna species were recorded on any of the sites during surveys. One (1) threatened flora species, the Capertee Stringybark (*Eucalyptus cannonii*), was recorded at Airly Creek as five (5) juvenile plants within the subject site and one mature tree in the study area (plus an additional existing record). More individuals are likely to be present within the study area, though a lack of reproductive material present at time of survey inhibited the identification of further individuals at this site. Fifty-one (51) threatened species records occur within a 10 km radius of the subject sites (Figure 7). Of these, the following were found to occur within the respective subject sites and/or study areas:

Airly Creek bridge

No other records of threatened species occur on the Airly creek site; however, Capertee Stringybark records occur within the study area to the north of the site. Gang-gang Cockatoo (*Callocephalon fimbriatum*), Diamond Firetail (*Stagonopleura guttata*) and Scarlet Robin (*Petroica boodang*) records occur within the broader locality (Figure 6).

Coco Creek bridge

Coco Creek subject site contain Scarlet Robin and Diamond Firetail records with Regent Honeyeater (*Anthochaera Phrygia*), Hooded Robin (*Melanodryas cucullata cucullata*), Swift Parrot (*Lathamus discolor*) and Black-chinned Honeyeater (*Melithreptus gularis gularis*) records present within the Study Area (Figure 6).

Crown Creek bridge

No threatened species records occur within the subject site for this site; however Swift Parrot and Black-chinned Honeyeater records occur within the Study Area (Figure 6).

A desktop assessment was undertaken to identify threatened flora and fauna species, populations and ecological communities listed under the BC Act, and Matters of National Environmental Significance (MNES) listed under the EPBC Act that may be affected by the Proposal.

For each species and ecological community, the specific habitat requirements have been considered in relation to the natural resources present within the study areas and described accordingly. Based on the presence or absence of important habitat resources required for each species, as well as the location of recent records, habitat connectivity, and the age of historical sightings, a likelihood of occurrence rating has been assigned to reflect the probability of whether each species will frequent and/or rely on resources within the study area (Appendix D).

A Protected Matters Search Tool search (PMST) revealed another thirty-seven (37) species and communities that have the potential to occur within the area. A total eighty-six (86) threatened species and three (3) threatened ecological communities are known or predicted to occur onsite following the desktop analysis (Appendix D). Of these, a total of thirty-two (32) threatened species and one (1) TEC were considered to have a moderate or higher likelihood of being impacted within the subject site (Table 12); consequently, Tests of Significance were conducted for these species (Appendix E and Appendix F).

Table 12 Threatened species with the potential to be impacted by the Proposal

Scientific Name	Common name	BC Act	EPBC Act
Frogs			
<i>Litoria booroolongensis</i>	Booroolong Frog	E	E
<i>Mixophyes balbus</i>	Stuttering Frog	E	V
Woodland Birds			
<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	CE
<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow	V	
<i>Callocephalon fimbriatum</i>	Gang-gang cockatoo	V	
<i>Calyptorhynchus lathami</i>	Glossy Black-cockatoo	V	
<i>Chthonicola sagittata</i>	Speckled Warbler	V	
<i>Climacteris picumnus</i>	Brown Treecreeper (eastern subspecies)	V	
<i>Daphoenositta chrysopterus</i>	Varied Sittella	V	
<i>Glossopsitta pusilla</i>	Little Lorikeet	V	
<i>Grantiella picta</i>	Painted Honeyeater	V	V
<i>Lathamus discolor</i>	Swift Parrot	E	CE

Scientific Name	Common name	BC Act	EPBC Act
<i>Melanodryas cucullata cucullata</i>	Hooded Robin	V	
<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater	V	
<i>Neophema pulchella</i>	Turquoise Parrot	V	
<i>Petroica boodang</i>	Scarlet Robin	V	
<i>Petroica phoenicea</i>	Flame Robin	V	
<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler	V	
<i>Stagonopleura guttata</i>	Diamond Firetail	V	
Bats, Owls and Gliders			
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V	
<i>Miniopterus australis</i>	Little Bent-winged Bat	V	
<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat	V	
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheathtail-bat	V	
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V	
<i>Vespadelus troughtoni</i>	Eastern Cave Bat	V	
<i>Ninox connivens</i>	Barking Owl	V	
<i>Tyto novaehollandiae</i>	Masked Owl	V	
<i>Tyto tenebricosa</i>	Sooty Owl	V	
<i>Petauroides Volans</i>	Greater Glider		V
<i>Petaurus norfolcensis</i>	Squirrel Glider	V	
Mammals			
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V	E
Plants			
<i>Eucalyptus cannonii</i>	Capertee Stringybark	V	
Threatened Ecological Communities			
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland		CE	CE

4.3.3 Migratory species

Of the thirteen (13) listed migratory species (PMST 2021) with the potential to occur within the locality, the Fork-tailed Swift (*Apus pacificus*), Black-faced Monarch (*Monarcha melanopsis*) and Satin Flycatcher (*Myiagra cyanoleuca*) were considered possible to occur following the field survey and habitat assessment.

4.3.4 Other MNES

The listed additional Matters of National Environmental Significance (MNES), that are predicted to occur within the locality, are unlikely to be impacted by the Proposal.

The assessment (PMST 2021) indicates that there are four (4) Wetlands of International Importance (Ramsar) between 300 and 900 km away from the study area. No marine areas occur within proximity to the study area.

4.3.5 SEPP Koala Habitat Protection

No Koalas, or signs of recent habitat use (e.g., scratchings or scats) were observed on any of the sites during surveys. One (1) historical Koala record occurs within a 10 km radius of the study area with the most recent recorded during 2004. Canopy vegetation within the study areas were dominated by *E. blakelyi*, *E. melliodora*, *E. gonicalyx*, with minor occurrences of *E. albens* at Crown Creek. *Eucalyptus albens* is listed as a koala feed tree species under Schedule 2 of SEPP 2020, however, this species constituted less than 15 % of total tree cover at this site and within each of the other study areas. Therefore, none of the three subject sites constitute core or potential Koala habitat as defined under SEPP 2020 (see Section 2.2.1).

Secondary feed tree species for koala as listed under SEPP 2021 do occur throughout the study areas (Table 16). As such, it is possible that the habitat resources within the subject sites are utilised by this species in a minor capacity.

4.4 Habitat connectivity

Each study area is well connected by a large tract of remnant vegetation, with access to substantial tracts of good quality fauna habitat in close proximity to each subject site (Figure 1). Whilst Coco Creek site is partially cleared, with the western portion mostly cleared of native vegetation, connectivity for this site is still good to the west and south where it adjoined to surrounding tracts of vegetation. Gardens of Stone National Park is located to the north and the south of the subject sites, intersected by Glen Davis Road. The road creates a partial incomplete existing risk for some terrestrial species. The broader locality contains large areas of good quality, intact native vegetation within conservation areas, with scattered cleared agricultural land and townships also present.

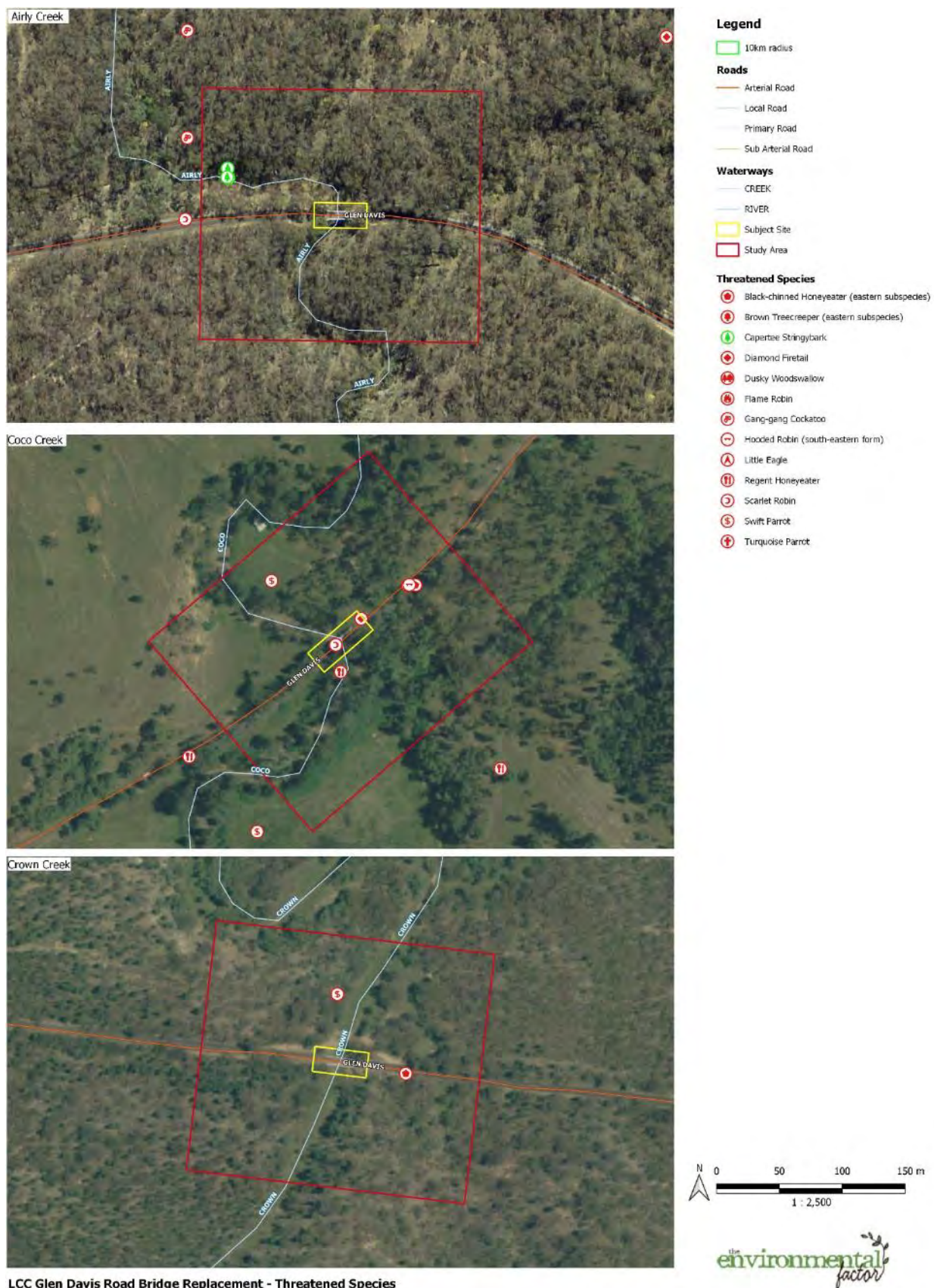


Figure 6 Threatened species records within and surrounding the Study Areas

5 IMPACT ASSESSMENT

This Section assesses the potential impacts of the Proposal during construction and operation on flora and fauna and their habitats.

5.1 Vegetation clearing and construction impacts

5.1.1 Flora species and vegetation communities

Approximately **12.93 ha** of native vegetation occurs within the three (3) study areas, with the potential to be impacted by the proposed works. Of this, approximately **0.51 ha** of native vegetation in total may be directly impacted or removed, including some mature trees and overstorey species, representing **3.81 %** of the overall native vegetation present within the immediate study area and **0.002 %** of the broader locality of all three sites combined. All three sites connect well with broader extents of remnant vegetation, with over 22, 186 ha of remnant native vegetation in a 10 km radius, immediately adjacent the sites. No threatened flora species or ecological communities are being significantly affected by the proposed works.

Airly Creek bridge

Works at Airly Creek bridge have the potential to directly impact **0.09 ha** of PCT 268, which occurs along Airly Creek waterway and **0.05 ha** of PCT 323 which occurs in the surrounding landscape. A further **0.55 ha** of PCT 268 and **4.12 ha** of PCT 323 may experience indirect impacts. Approximately eight (8) resprouting *E. goniocalyx*, six (6) *E. blakelyi* and five (5) juvenile *E. cannonii* occur within the impact footprint with the potential for direct impacts as they occur within the subject site. One (1) *E. Cannonii* occurs to the north of the study area and may experience potential indirect impacts. One (1) large hollow bearing *E. goniocalyx* occurs within the direct impact zone and may be potentially removed for crane access during the construction works. It is recommended that this tree be retained due to its size and habitat value.

Airly Creek subject site contains approximately **0.09 ha** of PCT 268 which aligns with a TEC (*White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland - CEEC*). An additional **0.55 ha** of PCT 268 occurs surrounding the subject site for a total combined potential impact to **0.64 ha** of PCT 268. This number is highly conservative and contains the mapped waterway and marginal PCT along an ecotone, with small slithers along the road reserve. Although there is potential direct impact to up to 4 % of TEC, the impact is considered much less (due to location, quality) than this and will consist of indirect impacts only.

Coco Creek bridge

Works at Coco Creek bridge have the potential to directly impact **0.12 ha** of PCT 85 consisting of up to 50 stems of regrowth *Casuarina cunninghamia* which occur along and adjacent to Coco Creek waterway and **0.03 ha** of PCT 268 which occurs in parts of the subject site. A very small (**0.001 ha**) section of non-native vegetation also falls within the subject site. A further **1.64 ha** of PCT 85, **1.99 ha** of PCT 268 and **1.19 ha** of PCT 0 (non-native) may experience indirect impacts. Coco Creek subject site also contains PCT 268 which is analogous to the TEC (*White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland - CEEC*). Up to **0.03 ha** may be directly impacted and a further **1.99 ha** indirectly impacted, for a total potential impact to **2.02 ha** of this TEC, representing approximately **0.05 %** direct impact within a 500 m radius.

Crown Creek bridge

Works at Crown Creek bridge have the potential to directly impact **0.05 ha** of PCT 281 in its derived riparian form, occurring along the creek. An additional **0.17 ha** of PCT 281 occurs adjacent the riparian zone within the subject site. A further **0.21 ha** of PCT 281 (derived) and **4.41 ha** of PCT 281 may experience indirect impacts.

Twenty-one (21) resprouting stems of native Eucalypt and Acacia species were recorded within the impact zone, all with stems less than 15 cm DBH. Dead and young trees will also be impacted for the works, including *E. brachychiton* and *Angophora floribunda*. A large Yellow Box (*E. melliodora*) with a DBH of 88 cm may be removed as part of works if a diversion is put in place. Retention of this tree has been recommended.

The Crown Creek site contains PCT 281 which aligns with TEC *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland*. Within the subject site, this PCT occurs in both the woodland (**0.17 ha**) and derived (**0.05 ha**) formations. The derived form occurs along Crown Creek and the woodland form surrounds the roadside and creek, with a total potential impact including indirect within the study area to **4.85 ha** of PCT 281. This assessment is conservative, with the actual impact to healthy, continuous TEC is considered negligible due to the quality, location and patch size of PCT present.

Potential impacts to the TEC *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* within the study areas has been assessed further in the ToS (Appendix E and Appendix F).

5.1.2 Fauna habitat removal

Up to two (2) habitat trees and a small number of other terrestrial habitat features including logs and small rocky outcrops will be impacted across the sites as part of the proposed works.

No long-term effects are likely to be suffered by fauna due to the loss of this highly localized habitat considering the existing nature of the site (disturbed road corridor and bridge area), the relatively small areas and nature of vegetation to be impacted, and the availability of good quality habitat within the immediate vicinity.

Two mature trees, one *E. goniocalyx* at Airly Creek and one *E. melliodora* at Crown Creek occur within the potential direct impact area. However, it is recommended that works be adapted to avoid impact to these habitat trees. The *E. goniocalyx* at Airly Creek occurs to the east of the bridge and contains a small hollow, with the *E. melliodora* at Crown Creek occurring within the possible diversion route.

Several stags, dead trees, rocky banks, old posts, wombat burrow and other smaller trees occur throughout the study areas (Figure 2 - Figure 4) and care should be taken to avoid these wherever possible. No large hollows were determined to be impacted as part of works. Appropriate mitigation measures (checking for animals present and adherence to clearing limits) will also reduce any potential impacts to individual fauna that may be present during construction works.

5.1.3 Aquatic habitats

Targeted frog surveys were undertaken to assess the likely impact to aquatic habitats and fauna. No threatened frog species were found to occur, however six (6) amphibian species were found to be

utilising the three sites during surveys (Table 10). Yabbies and a freshwater turtle were also observed utilizing aquatic habitat within the subject sites and study areas.

The bridge upgrades require the installation of new pilons, which will be drilled into the streambed. As a result, works are expected to impact the streambeds of all three creeks and will require diversion of water if creeks are flowing at the time of the surveys. Frogs were found to occur within all three study areas during surveys, with evidence of yabby also present at Crown Creek.

Airly Creek contains pools and healthy fringing vegetation and rocky banks upstream and downstream from the bridge, with some areas of these occurring within the subject site, and steep embankments either side of the bridge. Impacts to these habitats are likely to be contained to beneath the bridge, however runoff and sedimentation downstream from the works may occur.

Coco Creek is wide within the study area with a rocky streambed and Casuarina along the water's edge. Water was slowly flowing and pooled in some areas at the time of survey and rubbish was observed in and around the waterway. Impacts to the stream bed include the removal of Casuarina stems and possible runoff and sedimentation downstream.

Crown Creek contained the least amount of water, with the aquatic habitat limited to pools of water upstream and downstream of the site and a narrow slow flowing stream under the bridge. Aquatic habitats for this site were largely degraded and further impacts to the stream are likely to be contained to existing impacted areas, with possible runoff and sedimentation downstream if water is present during construction.

5.1.4 Habitat fragmentation

Clearing of thin strips of largely regenerating vegetation adjacent to an existing road and bridge structures is unlikely to markedly increase habitat fragmentation in the study area. The vegetation along the road corridor is well connected and will not be impacted beyond the subject site as part of works, ensuring that local fauna retain important connectivity to suitable habitat including tree hollows, nesting, roosting and feeding areas. The study areas occur between two large National Parks, Gardens of Stone National Park and Capertee National Park, which provide vast areas of remnant intact habitat for a variety of fauna. Muggi Murum-ban Nature preserve is also located directly to the north of the study areas.

5.1.5 Fauna injury and mortality

Due to the nature of the works, being associated with three separate bridge upgrades, the main threat to native fauna is injury, mortality and/or disturbance to frogs and aquatic fauna during instream works and bridge construction. Impact to reptiles that may use rocks to shelter is also possible. Increased fauna injury and mortality may occur as a result of road collisions with wildlife if road use increases as a result of the upgraded bridges, however this has not been quantified. The speed limit will not be increased along Glen Davis Road as a result of works and significant amounts of roadkill was observed at the time of surveys. Animals may suffer from incidental impacts through heavy machinery during construction. All mitigation measures outlined in Section 6 are to be adhered to, to reduce this threat.

5.2 Indirect impacts

Indirect impacts caused by clearing and bridge construction include increased noise and dust levels, potential erosion and runoff, and the introduction of weeds and other pathogens.

Noise, dust and runoff have the potential to travel long distances and disrupt wildlife outside of the study area. Presence of vehicles, machinery and staff within and surrounding the study area may also increase localised disturbance to terrestrial species that feed or breed in the area. Sedimentation during clearing and bridge construction works may migrate downhill into drainage lines. Indirect impacts to vegetation communities within the study area may also occur through increased activity causing erosion, dust settling on foliage and potential for the introduction of weeds or other pathogens.

Provided appropriate safeguards that form part of the proposal are followed, indirect impacts resulting from the Proposal are predicted to be minor and short-lived in nature.

5.3 Key threatening processes

A key threatening process (KTP) is defined under the BC Act as an action, activity or Proposal that:

- Adversely affects two (2) or more threatened species, populations or ecological communities.
- Could cause species, populations or ecological communities which are not currently threatened to become threatened.

There are currently thirty-nine (39) KTPs listed under the BC Act (DPIE 2021) eight (8) listed under the FM Act (DPIE 2021) and twenty-one (21) under the EPBC Act (DAWE 2021). Several KTPs are listed under more than one Act. Those KTPs potentially relevant to this Proposal are discussed in Table 11 below. The Proposal may exacerbate KTPs (as tabled below) and appropriate mitigation actions should be employed to minimise these impacts. Mitigation measures to limit the impacts of KTPs of relevance are discussed in Section 6.

Table 13 Key threatened processes relevant to the Proposal

KTP	Status	Comment
Clearing of native vegetation	BC Act; EPBC Act	The Proposal would result in the clearing of potentially 0.51 ha of native midstory and understory vegetation across the three (3) subject sites. The vegetation is in good condition. The clearing of this vegetation would comprise an increase in the operation of this KTP. The CEMP would include measures to minimise impacts on native vegetation and potentially threatened flora and fauna.
Removal of dead wood and dead trees	BC Act	There are low to moderate quantities of dead wood and dead trees scattered throughout the study area that would provide habitat resources for native fauna, including threatened species. The subject site also contains woody debris which would be removed as a result of the Proposal. The Proposal may increase the operation of this KTP.
Invasion of plant communities by perennial exotic grasses	BC Act	There is the potential for perennial exotic grasses to further invade native vegetation through disturbance during construction of the

KTP	Status	Comment
		Proposal. Mitigation measures outlined in Section 6 are likely to effectively limit the operation of this KTP.
Infection of native plants by <i>Phytophthora cinnamomi</i>	BC Act; EPBC Act	Construction activities have the potential to introduce the root-rot fungus <i>Phytophthora cinnamomi</i> into the broader study area, which could lead to dieback of vegetation. Mitigation measures are likely to effectively limit the operation of this KTP.
Introduction and establishment of Exotic Rust Fungi of the order <i>Pucciniales</i> pathogenic on plants of the family <i>Myrtaceae</i>	BC Act	Construction activities have the potential to introduce Myrtle Rust to the study area. Mitigation measures are likely to effectively limit the operation of this KTP.
Infection of frogs by amphibian chytrid causing the disease chytridiomycosis	BC, EPBC Act	All plant and equipment, particularly that which has been used in waterways/instream must be thoroughly checked for plant matter, seeds and other materials and thoroughly cleaned before arriving onsite.
Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants		

5.4 Impacts on listed threatened biota

Currently, direct impacts are predicted to affect **3.81 % (0.51 ha)** of native vegetation within the three combined study areas, with the potential to impact thirty-two (32) threatened species and one EEC listed under both the BC and EPBC Act.

Tests of Significance were completed for species listed under the BC Act that were considered likely to occur within, or be impacted by, the Proposal. A summary of the results of the Tests of Significance for threatened biota listed under the BC Act is provided in Table 12. The full assessments of significance for affected threatened biota listed under the BC Act are provided in Appendix E.

Table 14 Summary of Tests of Significance under the BC Act

Scientific Name	Common name	BC Act	Summary of Assessment of Significance
Frogs			
<i>Litoria booroolongensis</i>	Booroolong Frog	E	No significant impact
<i>Mixophyes balbus</i>	Stuttering Frog	E	No significant impact
Woodland Birds			
<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	No significant impact

Scientific Name	Common name	BC Act	Summary of Assessment of Significance
<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow	V	No significant impact
<i>Callocephalon fimbriatum</i>	Gang-gang cockatoo	V	No significant impact
<i>Calyptorhynchus lathamii</i>	Glossy Black-cockatoo	V	No significant impact
<i>Chthonicola sagittata</i>	Speckled Warbler	V	No significant impact
<i>Climacteris picumnus</i>	Brown Treecreeper (eastern subspecies)	V	No significant impact
<i>Daphoenositta chrysopterus</i>	Varied Sittella	V	No significant impact
<i>Glossopsitta pusilla</i>	Little Lorikeet	V	No significant impact
<i>Grantiella picta</i>	Painted Honeyeater	V	No significant impact
<i>Lathamus discolor</i>	Swift Parrot	E	No significant impact
<i>Melanodryas cucullata cucullata</i>	Hooded Robin	V	No significant impact
<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater	V	No significant impact
<i>Neophema pulchella</i>	Turquoise Parrot	V	No significant impact
<i>Petroica boodang</i>	Scarlet Robin	V	No significant impact
<i>Petroica phoenicea</i>	Flame Robin	V	No significant impact
<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler	V	No significant impact
<i>Stagonopleura guttata</i>	Diamond Firetail	V	No significant impact
Bats, Owls and Gliders			
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V	No significant impact
<i>Miniopterus australis</i>	Little Bent-winged Bat	V	No significant impact
<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat	V	No significant impact
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	V	No significant impact
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V	No significant impact
<i>Vespadelus troughtoni</i>	Eastern Cave Bat	V	No significant impact
<i>Ninox connivens</i>	Barking Owl	V	No significant impact
<i>Tyto novaehollandiae</i>	Masked Owl	V	No significant impact

Scientific Name	Common name	BC Act	Summary of Assessment of Significance
<i>Tyto tenebricosa</i>	Sooty Owl	V	No significant impact
<i>Petaurus norfolcensis</i>	Squirrel Glider	V	No significant impact
Mammals			
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V	No significant impact
Plants			
<i>Eucalyptus cannonii</i>	Capertee Stringybark	V	No significant impact
Threatened Ecological Communities			
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland		CE	No significant impact

The results of the Significant Impact Criteria assessments for threatened species listed under the EPBC Act that were considered likely to occur or be impacted by the Proposal are provided in Table 13. The full assessments of significance for affected threatened biota listed under the EPBC Act are provided in Appendix F.

Table 15 Summary of Tests of Significance under the EPBC Act

Scientific Name	Common name	EPBC Act	Summary of Assessment of Significance
Frogs			
<i>Mixophyes balbus</i>	Stuttering Frog	V	No significant impact
<i>Litoria booroolongensis</i>	Booroolong Frog	E	No significant impact
Woodland Birds			
<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	No significant impact
<i>Grantiella picta</i>	Painted Honeyeater	V	No significant impact
<i>Lathamus discolor</i>	Swift Parrot	CE	No significant impact
Bats, Owls and Gliders			
<i>Petauroides Volans</i>	Greater Glider	V	No significant impact
Mammals			

Scientific Name	Common name	EPBC Act	Summary of Assessment of Significance
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	E	No significant impact
Threatened Ecological Communities			
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland		CE	No significant impact

6 MITIGATION MEASURES

The below mitigation measures have informed this assessment and are considered part of the scope of works. Consequently, the below measures will be included in the project Review of Environmental Factors (REF) as Environmental Safeguards, which will serve as conditions of consent for the works. Evidence, in the form of documentation and accurately kept records, must be collected to ensure these actions have been completed as part of the project.

Mitigation measures for construction of the Proposal are as follows:

Timing of Clearing (terrestrial and aquatic)

- Where practicable, it is recommended to time the works outside of key bird and frog breeding seasons to avoid nest abandonment, breeding disruption, injury or death to native fauna. The works are proposed to occur in the winter of 2022, which falls outside of the breeding season for frog species of concern and also avoids the breeding season of most birds. Some owls breed within late winter, however no large tree hollows suitable for nesting owls will be directly impacted by the works and works are to take place during daylight hours.

Tree Removal

- Clearly delineate vegetation to be removed/retained with the assistance of an ecologist, or similarly qualified professional, and induct all site personnel as to the approved extent of clearing. Ensure that no clearing of vegetation occurs outside of the marked boundary.
- Where any trees requiring removal contain hollows, nests or other signs of occupation, a staged clearing approach must be undertaken where hollow limbs are removed carefully and incrementally by a qualified tree surgeon/arborist. Care should be taken to inspect limbs for fauna prior to their removal.
- Prior to clearing, a preclearance survey should be undertaken including inspection of hollows to confirm occupation by fauna. Care should be taken to identify nests and/or roosting sites. If fauna habitat is present (nests or potential tree hollows) the Council or Council's appointed contractor would contact the project ecologist for further advice prior to clearing.
- Ensure the presence of an ecologist or fauna spotter/catcher at all times during pre-clearing and clearing activities (including instream) to remove and relocate wildlife as necessary, and to attend to any wildlife that are injured as a result of works.
- All tree hollows removed are to be replaced with artificial hollows (nest boxes or augmented hollows) at a rate of 2:1. The size of nest box entrances is to be suited to the requirements of the threatened species that occupy the area/matched to those that have been removed. Nest boxes should be erected near the habitat to be removed in a suitable position prior to the commencement of vegetation clearing works. The project ecologist should be consulted to determine appropriate size and number to be erected.
- Felled trees or existing logs must be placed strategically and in proximity to the work site to provide refuge and potential habitat in the understorey whilst ensuring no further damage to surrounding vegetation. Placement of logs and felled trees will also aid in the regeneration of the area.

- Where additional vegetation removal is proposed this must first be assessed to consider the cumulative impacts against the approved clearance footprint, and if appropriate supervised by a qualified ecologist and Council's Environmental Officer.

Habitat Protection - terrestrial

- Clearly delineate vegetation to be removed/retained with the assistance of an ecologist, or similarly qualified professional, and induct all site personnel as to the approved extent of clearing. Ensure that no clearing of vegetation occurs outside of the marked boundary.
- The presence of a suitably qualified arborist is recommended during earthworks occurring near retained trees to avoid rootzones impacts.
- Ensure all work crew understand the importance of habitat features onsite including rocky outcrops, pools, stags, fallen timber and logs. Avoid impact to all habitat within the subject site wherever possible.
- All bridges are to be inspected for roosting bats/ birds and other fauna prior to works commencing and at the start of each workday.

Habitat Protection - aquatic

- Pools are to be checked for any signs of frogs, tadpoles, fish and any other aquatic life prior to works commencing.
- Divert waterflows around the site when working within streambeds for all bridges, ensuring water movement is maintained along the creeks at all times. If a dry works area is required, flow diversion pumping may be required.
- All snags, boulders and woody debris are to remain in place where possible.
- Multiple stage Erosion and Sediment Controls (ERSED) are to be installed and maintained throughout the construction phase of the project and removed once all areas are stabilised.
- Downstream monitoring of water quality using turbidity parameters (to be detailed in the CEMP) is to occur prior to and during construction works. No downstream siltation is to occur, and only clean water is to leave the site to ensure protection of downstream aquatic habitats.
- Any weeds or species of concern are to be removed from the subject sites and Council is to be notified

Rehabilitation

- Revegetation activities will be undertaken using native species sourced from local seed wherever possible. Areas to be re-seeded may be marked in the CEMP as a record of rehabilitation efforts made. Vegetation cover should be returned to the site within a reasonably practicable timeframe post clearing to reduce soil exposure and loss.
- Stream banks should be reinstated as near as practicable to their original profile. Where required, geofabric, which remains permeable to water and enhances plant growth, should be used to stabilise soil and sediment during re-establishment.

General

- Vehicles and machinery (including cranes) to work from the sealed road wherever possible and not to extend beyond the direct impact footprint.
- Ensure vehicles and machinery are cleaned and checked for any traces of weeds, seeds and mud prior to entering work site.
- All soils to be stockpiled at designated stockpile locations in a cleared area, within pre-approved zones.
- Appropriate erosion and sediment migration reduction/control measures should be in place.
- Heavy vehicles are not to be parked under tree drip lines/ leaf canopy to avoid compaction of soil, which is damaging to mature native trees and can cause dieback or tree mortality.
- All machinery and vehicles are to be clean and inspected prior to arriving on-site to reduce the spread of weeds and disease (e.g. *Phytophthora cinnamomi*) to the site.
- Strict hygiene protocols must be followed to ensure that no environmental weeds spread around during works or are introduced to site as a result of the proposed works. If weeds are accidentally transported to site, or identified during construction activities, all weed material should be immediately contained and removed from site.
- Locate stockpile sites away from waterways, drainage lines and native vegetation. Ensure these are appropriately stabilized in accordance with the 'Blue Book' (Landcom 2004).
- Declared weeds must be managed according to requirements under the Biosecurity Act 2015. It is recommended that all Weeds of National Significance should be managed to ensure they do not spread, and where possible eradicated.

7 CONCLUSION

The three bridge study areas (Airly Creek, Coco Creek and Crown Creek) contain varying levels of intact native vegetation and fauna habitats, together with areas disturbed by previous bridge and road construction. Vegetation within the subject sites includes predominantly remnant native vegetation and regrowth vegetation impacted from previous disturbance with varying levels of exotic weed infestation. The creek lines were predominantly healthy waterways with pools and fringing aquatic vegetation, though varying levels of disturbance were evident, particularly at Coco and Crown Creek's, where higher levels of disturbance were evident. The subject sites are surrounded by vast tracts of contiguous high quality native vegetation contained within National Parks and conservation areas, totaling 22, 186 ha of undisturbed National Park within the immediate 10 km radius of the sites.

The following ecological impacts area are associated with the Proposal based on the current design and replacement of the three (3) wooden bridge structures (Appendix A in project REF).

- Total impact area of **13.44 ha** across all three (3) sites, with clearing of up to **0.51 ha** of native vegetation, including some mature trees.
- Total potential impacts to the TEC *White Box-Yellow Box-Blakely's Red Gum Woodland and Derived Grassland*, listed as critically endangered under both the BC and EPBC Act of **7.51 ha** including direct impacts of approximately **0.34 ha** and indirect impacts to a further **7.17 ha** across all three (3) sites.
- Potential impacts to five (5) immature Capertee Stringybark (*Eucalyptus cannonii*) listed as Vulnerable under the BC Act at Airly Creek subject site, with further individuals recorded within the study area with potential for indirect impacts.
- Potential direct impact to two (2) mature habitat trees (one (1) at Airly Creek and one (1) at Crown Creek) along with other smaller trees, stags, logs and the bridge structures themselves, providing potential habitat for fauna including microbats, woodland birds and arboreal fauna.
- Direct impact to three (3) waterways during construction of the new bridges including impact to fringing aquatic vegetation, rock pools and other aquatic habitat, requiring a Fisheries permit.
- Indirect impacts to flora and fauna, including threatened species, occurring within the study area through noise and activity disturbance.
- Potential injury or mortality of small, terrestrial and aquatic fauna within the Proposal footprint.

Flora and fauna surveys, including habitat assessments and incidental flora and fauna recordings were completed during the site visit to identify important habitat components for any threatened species and ecological communities recorded, or that may occur, within the locality. Based on the desktop assessment, site visit and habitat assessments undertaken, thirty-two (32) threatened species and one (1) TEC were considered as having the potential to be impacted as a result of the proposal, including thirty (30) species listed under the BC Act and seven (7) listed under the EPBC Act, with the TEC listed under both, as follows:

- Booroolong Frog – E (BC and EPBC Act)

- Stuttering Frog – E (BC Act), V (EPBC Act)
- Woodland Birds – fifteen (15) listed as V, one (1) as E, and (1) as CE (BC Act). Two (2) species listed as CE and one (1) as V (EPBC Act).
- Six (6) species of bat and three (3) species of owl, all listed as V (BC Act)
- Greater glider, listed as V (EPBC Act)
- Spotted-tailed quoll – V (BC Act), E (EPBC Act)
- Capertee stringybark – V (BC Act)
- *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* – CE (BC and EPBC Act).

Tests of significance for the above species were prepared in accordance with Section 1.7 of the EP&A Act and the EPBC Act *Matters of National Environmental Significance – Significant Impact Criteria Guidelines* (DEWHA, 2009). A targeted frog survey was also undertaken for the species listed. These assessments have concluded that the Proposal is unlikely to have a significant negative effect on the threatened species occurring within the impact footprint. Therefore, Species Impact Statements and / or Referral to the Environment Minister are not required for this project.

Mitigation measures proposed for these works include those relating specifically to instream works, erosion and runoff control and protection of sensitive aquatic and riparian habitats. Ensuring impact areas and vegetation clearing are restricted to pre-specified areas only, timing of clearing outside of key breeding times for species present, erection of sediment and erosion control, stockpiling and earthworks in line with Bluebook requirements, and adherence to strict hygiene procedures are some of the proposed mitigation measures for this proposal. Two mature trees occurring within the Airly Creek and Crown Creek subject sites are recommended to be retained through project planning.

8 REFERENCES

BOM (2021) Weather observations at Marrangaroo weather station

DAWE 2021 Species Profile and Threats Databases

DAWE 2021 Protected Matters Search Tool for MNES listed under the EPBC Act.
<http://www.environment.gov.au/epbc/protected-matters-search-tool>

DPI 2021 Priority Weeds of the Central Tablelands [NSW WeedWise](#)

DPI 2021 Weeds of National Significance [NSW WeedWise](#)

DPIE 2020, NSW Survey Guide for Threatened Frogs, environment.nsw.gov.au

DPIE 2021 Areas of Outstanding Biodiversity register [Area of Outstanding Biodiversity Value register | NSW Environment, Energy and Science](#)

DPIE 2021 Biodiversity Values Map <https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BVMap>

DPIE 2021 Key threatening processes <http://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/about-threatened-species/key-threatening-processes> accessed Feb 2021

DPIE 2021 SEPP Koala Habitat Protection 2020 [Koala Habitat Protection SEPP - \(nsw.gov.au\)](#)

DPIE 2021 NSW Government Vegetation Regulatory Map
<https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=NVRMap>

DPIE (2021) Bionet Wildlife Atlas Threatened species records, which holds data from a number of custodians.

Greater Glider Action Statement, Victorian Government, 2019.

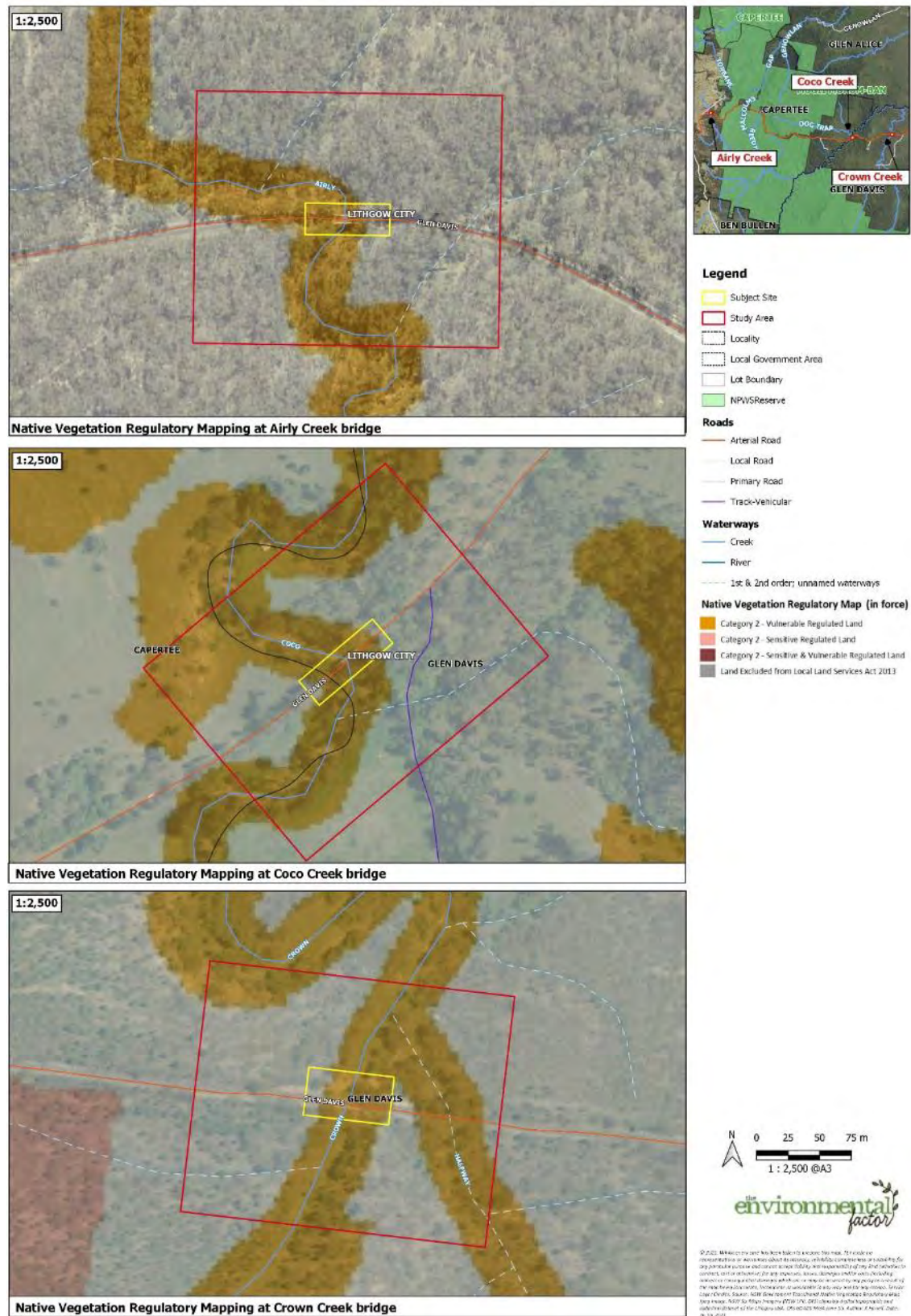
Lithgow City Council. Weeds Management, 2021, <https://council.lithgow.com/environment/weeds-management/>

New South Wales Flora online – PlantNET 2021 <http://plantnet.rbgsyd.nsw.gov.au/floraonline.html>
[NSW Government, State Environmental Planning Policy \(Koala Habitat Protection\) 2020, EP&A Act 1979](#)

9 APPENDICES

Appendix	Item
Appendix A	Native Vegetation Regulatory Map
Appendix B	Biodiversity Values Map
Appendix C	Species recorded during field investigations
Appendix D	Threatened species likelihood of occurrence table
Appendix E	Tests of Significance for State listed species
Appendix F	EPBC Act Significant Impact Criteria Assessments
Appendix G	BOM Daily Weather Observations

Appendix A – Native Vegetation Regulatory Map



The figure consists of three maps, each showing a different bridge location for biodiversity value mapping. Each map has a scale of 1:2,500.

- Top Map: Biodiversity Value Mapping at Airlie Creek bridge**
 - Scale: 1:2,500
 - Legend:
 - Subject Site (Yellow box)
 - Study Area (Red outline)
 - Biodiversity Values (Purple shading)
 - Locality (Dashed line)
 - Local Government Area (Dashed line)
 - Lot Boundary (Dashed line)
 - NPWS Reserve (Green shading)
 - Roads:
 - Arterial Road (Thick solid line)
 - Local Road (Thin solid line)
 - Primary Road (Thick dashed line)
 - Track-Vehicular (Thin dashed line)
 - Waterways:
 - Creek (Blue line)
 - River (Thick blue line)
 - 1st & 2nd order; unnamed waterways (Thin blue line)
- Middle Map: Biodiversity Value Mapping at Coco Creek bridge**
 - Scale: 1:2,500
 - Legend:
 - Subject Site (Yellow box)
 - Study Area (Red outline)
 - Biodiversity Values (Purple shading)
 - Locality (Dashed line)
 - Local Government Area (Dashed line)
 - Lot Boundary (Dashed line)
 - NPWS Reserve (Green shading)
 - Roads:
 - Arterial Road (Thick solid line)
 - Local Road (Thin solid line)
 - Primary Road (Thick dashed line)
 - Track-Vehicular (Thin dashed line)
 - Waterways:
 - Creek (Blue line)
 - River (Thick blue line)
 - 1st & 2nd order; unnamed waterways (Thin blue line)
- Bottom Map: Biodiversity Value Mapping at Crown Creek bridge**
 - Scale: 1:2,500
 - Legend:
 - Subject Site (Yellow box)
 - Study Area (Red outline)
 - Biodiversity Values (Purple shading)
 - Locality (Dashed line)
 - Local Government Area (Dashed line)
 - Lot Boundary (Dashed line)
 - NPWS Reserve (Green shading)
 - Roads:
 - Arterial Road (Thick solid line)
 - Local Road (Thin solid line)
 - Primary Road (Thick dashed line)
 - Track-Vehicular (Thin dashed line)
 - Waterways:
 - Creek (Blue line)
 - River (Thick blue line)
 - 1st & 2nd order; unnamed waterways (Thin blue line)

A detailed legend on the right side of the figure explains the symbols used in the maps:

- Legend**
 - Subject Site (Yellow box)
 - Study Area (Red outline)
 - Biodiversity Values (Purple shading)
 - Locality (Dashed line)
 - Local Government Area (Dashed line)
 - Lot Boundary (Dashed line)
 - NPWS Reserve (Green shading)
- Roads**
 - Arterial Road (Thick solid line)
 - Local Road (Thin solid line)
 - Primary Road (Thick dashed line)
 - Track-Vehicular (Thin dashed line)
- Waterways**
 - Creek (Blue line)
 - River (Thick blue line)
 - 1st & 2nd order; unnamed waterways (Thin blue line)

A scale bar at the bottom right indicates distances of 0, 25, 50, and 75 meters, with a scale of 1:2,500 @A3.

the environmental factor

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Appendix C – Species recorded during field surveys

Table 16 Flora recorded during surveys

Latin name	Common Name	E, N	Airly Ck	Coco Ck	Crown Ck
<i>Acacia dawsonii</i>	Poverty Wattle	N	x		
<i>Acacia dealbata</i>	Silver Wattle	N	x		
<i>Acacia decora</i>	Western Silver Wattle	N		x	x
<i>Acacia implexa</i>	Hickory Wattle	N	x	x	x
<i>Acacia paradoxa</i>	Kangaroo Thorn	N			x
<i>Acacia subulata</i>	Awl-Leaved Wattle	N		x	x
<i>Acacia verniciflua</i>	Varnish Wattle	N			
<i>Acaena novae - zelandiae</i>	Bidgee Widgee	N	x		
<i>Adiantum aethiopicum</i>	Maidenhair Fern	N		x	
<i>Angophora floribunda</i>	Rough-Barked Apple	N		x	x
<i>Aristida ramosa</i>	Purple Wiregrass	N		x	
<i>Austrostipa ramosissima</i>	Stout Bamboo Grass	N		x	
<i>Brachychiton populneus</i>	Kurrajong	N		x	x
<i>Brassicaceae sp.</i>	-	N		x	
<i>Bursaria spinosa</i>	Boxthorn	N	x	x	
<i>Callitris endlicheri</i>	Black Cypress Pine	N			x
<i>Carthamus lanatus</i>	Saffron Thistle	E		x	x
<i>Cassinia sifton</i>	Sifton Bush	N	x		
<i>Casuarina cunningghamii</i>	River Oak	N		x	
<i>Cirsium vulgare</i>	Spear Thistle	E	x		
<i>Clematis aristata</i>	Old Man's Beard	N	x	x	
<i>Conyza bonariensis</i>	Flaxleaf Fleabane	E	x		
<i>Cymbopogon refractus</i>	Barbed Wiregrass	N			x
<i>Dianella revoluta</i>	Blueberry Lily	N	x		
<i>Dichondra repens</i>	Kidney Weed	N		x	x
<i>Dodonaea viscosa</i>	Sticky Hop-Bush	N		x	x

Latin name	Common Name	E, N	Airly Ck	Coco Ck	Crown Ck
<i>Eucalyptus albens</i> *	White Box	N			x
<i>Eucalyptus blakelyi</i> *	Blakely's Red Gum	N	x		x
<i>Eucalyptus cannonii</i>	Capertee Stringybark	N, BC-V			
<i>Eucalyptus crebra</i>	Narrow-Leaved Ironbark	N			x
<i>Eucalyptus dealbata</i> *	Tumbledown Red Gum	N			x
<i>Eucalyptus gonicalyx</i> *	Long-Leaved Box	N	x	x	
<i>Eucalyptus macrorhyncha</i> *	Red Stringybark	N	x		
<i>Eucalyptus melliodora</i> *	Yellow Box	N		x	
<i>Eucalyptus rossii</i> *	Inland Scribbly Gum	N			
<i>Eucalyptus sideroxylon</i> *	Mugga Ironbark	N			x
<i>Geranium solanderi</i>	Native Geranium	N	x	x	x
<i>Glycine clandestina</i>	-	N			x
<i>Gonocarpus tetragynus</i>	-	N			
<i>Goodenia hederacea</i>	Forest Goodenia	N			
<i>Hardenbergia violacea</i>	Purple Coral Pea	N	x		x
<i>Hibbertia sp.</i>	-	N		x	
<i>Hovea sp.</i>	-	N			
<i>Hypericum perforatum</i>	St Johns Wort	E		x	x
<i>Hypochaeris radicata</i>	Catsear	N		x	
<i>Juncus usitatus</i>	-	N		x	
<i>Lepidosperma laterale</i>	-	N	x		
<i>Leucopogon muticus</i>	Blunt Beard-Heath	N			
<i>Lomandra filliformis</i>	Wattle Mat-Rush	N	x		x
<i>Lomandra longifolia</i>	Spiny-Headed Mat-Rush	N	x		x
<i>Lomandra multiflora</i>	Many-Flowered Mat-Rush	N			
<i>Lomatia silaifolia</i>	Crinkle Bush	N			
<i>Melicytus dentatus</i>	Tree Violet	N		x	

Latin name	Common Name	E, N	Airly Ck	Coco Ck	Crown Ck
<i>Mentha satereioides</i>	Creeping Mint	N		x	
<i>Microlaena stipoides</i>	Weeping Grass	N		x	x
<i>Persoonia linearis</i>	Narrow-Leave Geebung	N			
<i>Phalaris aquatica</i>	Phalaris	E	x		
<i>Phragmites australis</i>	Common Reed	N			
<i>Plantago lanceolata</i>	Plantain	E	x	x	
<i>Poa labillei</i>	Tussock Grass	N	x		
<i>Poa sieberiana</i>	-	N	x		
<i>Rubus fruticosus</i>	Blackberry	E, WoNS	x	x	x
<i>Senecio sp.</i>	-	E	x		
<i>Solanum nigrum</i>	Black-Berry Nightshade	E	x		x
<i>Themeda triandra</i>	Kangaroo Grass	N	x	x	x
<i>Typha orientalis</i>	Broadleaf Cumbungi	N	x		x
<i>Verbena rigida</i>	Veined Verbena	E	x	x	x
<i>Vittadinia cuneata</i>	Fuzzweed	N	x	x	x

*= koala SEPP Schedule 2 trees SEPP 2021

Table 17 Fauna recorded during surveys

Taxa	Species Name	Common Name	Airly	Coco	Crown
Amphibia	<i>Crinia signifera</i>	Eastern Froglet	x	x	x
Amphibia	<i>Crinia parainsignifera</i>	Eastern Sign-bearing froglet	x		x
Amphibia	<i>Limnodynastes dumerilii</i>	Eastern Banjo Frog	x	x	x
Amphibia	<i>Limnodynastes peronii</i>	Striped Marsh Frog	x		
Amphibia	<i>Limnodynastes tasmaniensis</i>	Spotted Marsh Frog			x
Amphibia	<i>Litoria leseuri</i>	Stony Creek Frog		x	
Aves	<i>Cacomantis flabelliformis</i>	Fantailed Cuckoo		x	
Aves	<i>Callocalia esculenta</i>	Glossy Swiftlet			x
Aves	<i>Colluricincla harmonica</i>	Grey Shrike-Thrush		x	
Aves	<i>Corcorax melanorhamphos</i>	White-Winged Chough		x	
Aves	<i>Cormobates leucophaea</i>	White-Throated Treecreeper	x		x
Aves	<i>Corvus coronoides</i>	Australian Raven	x	x	

Aves	<i>Dacelo novaeguneae</i>	Laughing Kookaburra			x
Aves	<i>Eopsaltria australis</i>	Yellow Robin		x	
Aves	<i>Geopelia striata</i>	Peaceful Dove		x	
Aves	<i>Gerygone albogularis</i>	White-Throated Gerygone			x
Aves	<i>Lichenostomus chrysops</i>	Yellow-Faced Honeyeater	x	x	
Aves	<i>Malurus cyaneus</i>	Superb Fairy Wren	x	x	
Aves	<i>Pardalotus punctatus</i>	Spotted Pardalote	x		x
Aves	<i>Philemon corniculatus</i>	Noisy Friarbird	x	x	x
Aves	<i>Rhipidura leucophrys</i>	Willie Wagtail		x	x
Aves	<i>Taeniopygia bichenovii</i>	Double-Barred Finch		x	
Crustacean	<i>Cherax destructor</i>	Yabby	x		x
Mammalia	<i>Macropus sp.</i>	Macropod Scat			x
Mammalia	<i>Vombatus ursinus</i>	Wombat Scat		x	
Mammalia	<i>Pseudocheirus peregrinus</i>	Common Ringtail Possum	x		
Mammalia	<i>Trichosorus vulpecula</i>	Common Brushtail Possum	x		
Reptilia	<i>Chelodina longicollis</i>	Eastern snake-necked turtle			x

Appendix D – Threatened Species Likelihood of Occurrence

The below assessment includes national and state significant species from the following sources:

- Bionet Atlas of NSW Wildlife
- DAWE database (PMST search)
- Current survey
- Search area is 10 km radius.
- Not considered further pelagic seabirds, shorebirds, sandpipers, turtles, whales, sharks - no preferred marine or coastal habitat in study area.

All habitat information is taken from NSW DPIE and Commonwealth DAWE Threatened Species profiles (DPIE 2021 DAWE 2021) unless otherwise stated. The codes used in this table are:

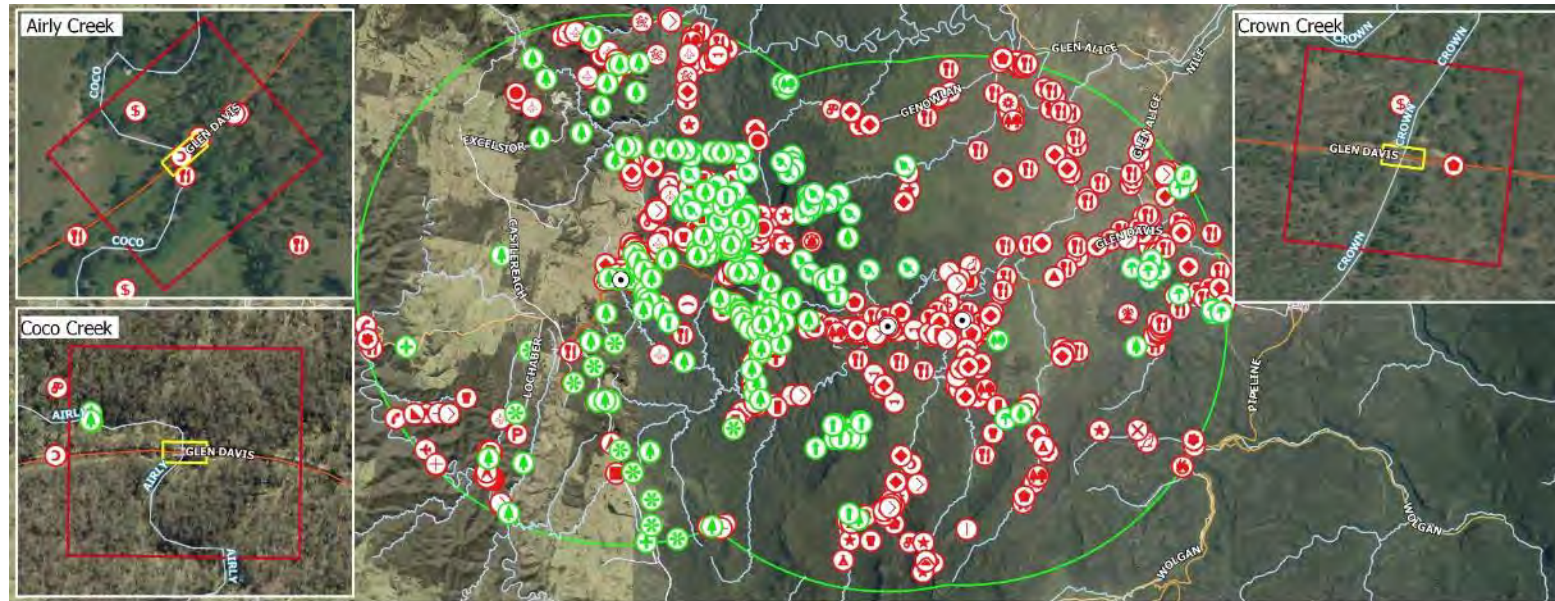
- CE – Critically Endangered
- E – Endangered
- V – Vulnerable
- EP – Endangered Population
- C – CAMBA
- J – JAMBA
- R – ROKAMBA
- CEEC – Critically Endangered Ecological Community
- EEC – Endangered Ecological Community

Table 18 Likelihood of occurrence definitions

Likelihood of occurrence	Definition
Known	Species recorded in the subject site.
Likely	Species previously recorded within a 10 kilometre radius of the subject site and suitable habitat occurs within the subject site.
Possible	Species previously recorded within a 10 kilometre radius of the subject site but only marginal suitable habitat recorded. OR Species not previously recorded within a 10 kilometre radius of the subject site, but the Proposal footprint is within the species known distribution and suitable habitat occurs within the subject site.
Unlikely	Species previously recorded within a 10 kilometre radius of the subject site but no suitable habitat recorded.
Nil	Species not previously recorded within a 10 kilometre radius of the subject site and no suitable habitat occurs in the area.

Table 19 Likelihood of impact definitions

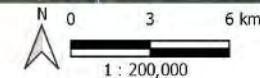
Likelihood of impact	Definition
Nil	Species/ community will not be impacted by the Proposal.
Low	Species / community is unlikely to be impacted by the Proposal.
Moderate	Species / community is known or likely to occur within the study area however the Proposal does not impact on important habitat resources.
High	Species / community is known or likely to occur within the study area and the Proposal will impact on important habitat resources.



LCC Glen Davis Road Bridge Replacement - Threatened Species within a 10km radius of proposed bridge works

Legend

 10km radius	Threatened Species	● Dusky Woodswallow	● Koala	● Powerful Owl	● Swift Parrot
● Bridges	● Barking Owl	● Eastern Cave Bat	● Large Bent-winged Bat	● Regent Honeyeater	● Turquoise Parrot
Roads	● Black Falcon	● Eastern False Pipistrelle	● Large-eared Pied Bat	● Rosenberg's Goanna	● Varied Sittella
— Arterial Road	● Black Gum	● Flame Robin	● Little Bent-winged Bat	● Rylstone Bell	● White-throated Needletail
— Local Road	● Black-chinned Honeyeater (eastern subspecies)	● Gang-gang Cockatoo	● Little Eagle	● Scarlet Robin	● Wollemi Mint-bush
— Primary Road	● Booroolong Frog	● Glossy Black-Cockatoo	● Little Lorikeet	● Sooty Owl	● Yellow-bellied Shearwater
— Sub Arterial Road	● Broad-headed Snake	● Greater Broad-nosed Bat	● Masked Owl	● Speckled Warbler	● Darwinia peduncularis
Waterways	● Brown Treecreeper (eastern subspecies)	● Greater Glider	● Mount Vincent Mint-bush	● Spotted-tailed Quoll	● Grevillea obtusiflora
— CREEK	● Capertee Stringybark	● Grey-crowned Babbler (eastern subspecies)	● New Holland Mouse	● Square-tailed Kite	● Phebalium bifidum
— RIVER	● Clandulla Geebung	● Grey-headed Flying-fox	● Oriental Cuckoo	● Squirrel Glider	● Pultenaea sp. Genowlan Point
	● Diamond Firetail	● Hooded Robin (south-eastern form)	● Painted Honeyeater	● Stuttering Frog	



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Figure 7 Threatened species recorded within 10 km of the study area

Table 20 Threatened biota likelihood of occurrence table

Scientific Name	Common name	BC Act	EPBC Act	Habitat	Source	Likelihood of Occurrence within the Study Area	Likelihood of impact within the Study Area
Amphibia							
<i>Heleioporus australiacus</i>	Giant Burrowing Frog		V	Found in heath and woodland in a variety of soils – except clay based soils. In non-breeding season it may be found over 300 m from the breeding site, buried beneath the leaf litter. Breeding habitat is in first or second order streams. This species is long-lived.	PMST	Possible	Low
<i>Litoria booroolongensis</i>	Booroolong Frog	E	E	The Booroolong Frog inhabits riffle habitat in pristine rivers and streams. Water quality is important for this species as it does not tolerate high turbidity and pollution levels.	PMST, Bionet	Possible – not detected during targeted surveys	Moderate
<i>Mixophyes balbus</i>	Stuttering Frog	E	V	This species is found in wet, tall open forest and rainforest and in the foothills and escarpment on the eastern side of the Great Dividing Range. Breed in streams during summer after heavy rain.	PMST, Bionet	Possible – not detected during targeted surveys	Moderate
Birds							
<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	CE	The Regent Honeyeater is a migratory woodland bird moving across the landscape in response to climatic conditions and food availability. This species breeds has only three key breeding locations. The closest breeding colony is located near the Capertee Valley. This species prefers Box-Ironbark woodland and riparian forests	Bionet, PMST	Known to occur in Coco Creek study area	Moderate

Scientific Name	Common name	BC Act	EPBC Act	Habitat	Source	Likelihood of Occurrence within the Study Area	Likelihood of impact within the Study Area
				particularly habitats with mature trees, high canopy cover and abundance of mistletoes.			
<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow	V	-	Dry, open eucalypt forests and woodland are the preferred habitat. Mallee associations with a sparse understorey of eucalypt saplings, acacias and other shrubs and ground cover of grasses or sedges and woody debris are also inhabited. Farmland, particularly forest or woodland edges are also inhabited and very occasionally, moist forest or rainforest.	Bionet	Likely	Moderate
<i>Botaurus poeciloptilus</i>	Australasian Bittern	E	E	Preferred habitat is comprised of wetlands with tall dense vegetation, where it forages in still, shallow water up to 0.3 m deep, often at the edges of pools or waterways, or from platforms or mats of vegetation over deep water. It favours permanent and seasonal freshwater habitats, particularly those dominated by sedges, rushes and reeds (e.g. Phragmites, Cyperus, Eleocharis, Juncus, Typha, Baumea, Bolboschoenus) or cutting grass (Gahnia) growing over a muddy or peaty substrate.	PMST	Unlikely	Low
<i>Callocephalon fimbriatum</i>	Gang-gang cockatoo	V,P		The Gang-gang Cockatoo favours old growth forests for roosting and requires tree hollows for nesting. During summer it is found in tall mountain forests and wet sclerophyll forests while during winter it moves into drier woodlands and can be found in more urban areas.	Bionet	Known to occur - in close proximity to Airly Creek Study Area	Moderate

Scientific Name	Common name	BC Act	EPBC Act	Habitat	Source	Likelihood of Occurrence within the Study Area	Likelihood of impact within the Study Area
				The Gang-gang Cockatoo is distributed from southern Victoria through south- and central-eastern New South Wales. In New South Wales, the Gang-gang Cockatoo is distributed from the south-east coast to the Hunter region, and inland to the Central Tablelands and south-west slopes. Favours old growth forest and woodland attributes for nesting and roosting. Nests are located in hollows that are 10 cm in diameter or larger and at least 9 m above the ground in eucalypts.			
<i>Calyptrorhynchus lathamii</i>	Glossy Black-cockatoo	V		This species predominantly nests in eucalypts and feeds on casuarinas. It nests in both living and dead trees. Glossy Black Cockatoos prefer to live in untouched, rugged country, especially that containing Brigalow scrub or rocky hilly country. Other habitat includes where she-oaks are common, coastal woodlands and drier forest areas as well as timbered watercourses. The species is uncommon although widespread throughout suitable forest and woodland habitats, from the central Queensland coast to East Gippsland in Victoria, and inland to the southern tablelands and central western plains of NSW, with a small population in the Riverina.	Bionet	Possible	Moderate
<i>Calidris ferruginea</i>	Curlew Sandpiper	E	CE	Mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms.	PMST	Unlikely	Nil

Scientific Name	Common name	BC Act	EPBC Act	Habitat	Source	Likelihood of Occurrence within the Study Area	Likelihood of impact within the Study Area
				They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand.			
<i>Chthonicola sagittata</i>	Speckled Warbler	V	-	The Speckled Warbler occupies open Eucalypt woodlands with a grassy understory and often rocky outcrops. Relatively large undisturbed areas are required to sustain this species in an area.	Bionet	Likely	Moderate
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	V	-	The Brown Treecreeper maintains a territory in open woodland habitats (including Box-Gum Woodland). It prefers woodlands dominated by stringybarks and rough barked eucalypts with a grassy understory. It requires tree hollows in live and dead trees or stumps for nesting.	Bionet	Likely	Moderate
<i>Daphoenositta chrysoptera</i>	Varied Sitella	V		The Varied Sitella prefers open eucalypt and Acacia woodlands with stringybark eucalypts from which to glean insects. They are territorial preferring to use the same tree fork to construct nests for breeding.	Bionet	Likely	Moderate
<i>Falco subniger</i>	Black Falcon	V		Mostly occurs in inland regions. Large old trees are critical hunting and nesting resources. Tree lined watercourses and isolated woodlands in arid and semi-arid areas are preferred nesting and roosting habitat.	Bionet	Possible	Low

Scientific Name	Common name	BC Act	EPBC Act	Habitat	Source	Likelihood of Occurrence within the Study Area	Likelihood of impact within the Study Area
<i>Falco hypoleucos</i>	Grey Falcon	E		Restricted to shrubland, grassland and wooded watercourses and sometimes near wetlands where surface water attracts prey. Occasionally found in open woodlands near the coast. Nests are constructed in high living eucalypts near a watercourse.	PMST	Possible	Low
<i>Glossopsitta pusilla</i>	Little Lorikeet	V		In NSW Little Lorikeets are distributed in forests and woodlands from the coast to the western slopes of the Great Dividing Range, extending westwards to the vicinity of Albury, Parkes, Dubbo and Narrabri. They are considered nomadic responding to food availability and highly gregarious often foraging in mixed flocks. They occur in dry, open eucalypt forests and woodlands using roadside vegetation. They rely on nectar and pollen, particularly on profusely-flowering eucalypts, melaleucas and mistletoes. On the western slopes and tablelands White Box <i>E. albens</i> and Yellow Box <i>E. melliodora</i> are particularly important food sources for pollen and nectar respectively. They often return to the same nest hollow annually preferring smooth barked Eucalypts with small hollows (3cm entrance diameter).	Bionet	Likely	Moderate
<i>Grantiella picta</i>	Painted Honeyeater	V	V	The Painted Honeyeater is typically rare throughout its range occupying dense dry open forests with an abundance of mistletoe.	Bionet, PMST	Likely	Moderate

Scientific Name	Common name	BC Act	EPBC Act	Habitat	Source	Likelihood of Occurrence within the Study Area	Likelihood of impact within the Study Area
<i>Hirundapus caudacutus</i>	White-throated Needletail	-	V	This species is almost exclusively aerial over a wide variety of habitats.	Bionet, PMST	Possible	Low
<i>Hieraaetus morphnoides</i>	Little Eagle	V		The Little Eagle is seen over woodland and forested lands and open country, extending into the arid zone. It tends to avoid rainforest and heavy forest.	Bionet	Possible	Low
<i>Lathamus discolor</i>	Swift Parrot	E	CE	The Swift Parrot breeds in Tasmania and returns to the south-eastern mainland to forage over the cooler months (March – October). In NSW mostly occurs on the coast and south west slopes. They move across the landscape to forage on lerp infestations or an abundance of eucalypt flowers. Preferred feed trees include Eucalyptus robusta, Corymbia maculate, C. gummifera, E. sideroxylon and E. albens.	Bionet, PMST	Known to occur in Coco Creek and Crown Creek Study Areas	Moderate
<i>Lophoitinia isura</i>	Square-tailed Kite	V		Timbered watercourses are preferred but this species is found in a variety of timbered habitats. Has a large hunting range – over 100 km ² . In arid north-western NSW, has been observed in stony country with a ground cover of chenopods and grasses, open acacia scrub and patches of low open eucalypt woodland.	Bionet	Likely	Low
<i>Leipoa ocellata</i>	Malleefowl	E	V	The Malleefowl typically occupies mallee communities with a spinifex understory but occasionally uses woodlands with a denser understory. It requires light sandy loam soils with a diverse shrub and understory.	PMST	Nil	Nil

Scientific Name	Common name	BC Act	EPBC Act	Habitat	Source	Likelihood of Occurrence within the Study Area	Likelihood of impact within the Study Area
<i>Melanodryas cucullata cucullata</i>	Hooded Robin	V		The Hooded Robin prefers lightly wooded forests such as eucalypt woodlands, acacia scrub and mallee with structurally diverse habitats including saplings, tall native grasses and an abundance of fallen leaf litter and woody debris to forage. They occupy home ranges of 10 hectares to 30 hectares throughout the year.	Bionet	Known to occur in Coco Creek Study Area	Moderate
<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater	V		The Black-chinned Honeyeater occupies open woodland habitats and open forests of smooth gums, stringybarks, ironbarks and Casuarinas and Melaleucas. They require large foraging territories of woodland patches at least 5 hectares large.	Bionet	Known to occur in Coco Creek and Crown Creek Study Area	Moderate
<i>Neophema pulchella</i>	Turquoise Parrot	V		This species lives on the edges of eucalypt woodland adjoining clearings, timber ridges and creeks in farmland. Nests in hollows, posts or logs and feeds in the shade of a trees, on the ground, looking for seeds and herbaceous plants, also browsing on vegetable matter.	Bionet	Likely	Moderate
<i>Ninox connivens</i>	Barking Owl	V		Found throughout continental Australia except for central arid regions. The Barking Owl requires large tree hollows in order to roost and breed. It occupies open forests and woodlands including partially cleared farmland. They often roost in densely formed Acacia and Casuarina species. A large portion of its diet consists of arboreal mammals but can adapt to ground	Bionet	Likely	Moderate

Scientific Name	Common name	BC Act	EPBC Act	Habitat	Source	Likelihood of Occurrence within the Study Area	Likelihood of impact within the Study Area
				dwelling species where the habitat cannot sustain preferred prey. Requires very large permanent territories in most habitats due to sparse prey densities.			
<i>Ninox strenua</i>	Powerful Owl	V		The Powerful Owl is the largest owl in Australasia. It is a typical hawk-owl, with large yellow eyes and no facial-disc. In NSW, it is widely distributed throughout the eastern forests from the coast inland to tablelands, with scattered records on the western slopes and plains. The species breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. It roosts by day in dense vegetation comprising species such as Turpentine <i>Syncarpia glomulifera</i> , Black She-oak <i>Allocasuarina littoralis</i> , Blackwood <i>Acacia melanoxylon</i> , Rough-barked Apple <i>Angophora floribunda</i> , Cherry Ballart <i>Exocarpus cupressiformis</i> and a number of eucalypt species.	Bionet	Likely	Moderate
<i>Numenius madagascariensis</i>	Eastern Curlew	-	CE	The Eastern Curlew is found on intertidal mudflats and sandflats, often with beds of seagrass, on sheltered coasts, especially estuaries, mangrove swamps, bays, harbours and lagoons. It is rarely found inland. The Eastern Curlew occurs only in our flyway, and about 75 per cent of the world's curlews winter in Australia.	PMST	Unlikely	Low

Scientific Name	Common name	BC Act	EPBC Act	Habitat	Source	Likelihood of Occurrence within the Study Area	Likelihood of impact within the Study Area
<i>Petroica boodang</i>	Scarlet Robin	V		The Scarlet Robin requires an abundance of fallen logs and timber debris in which to forage for invertebrates. Following the breeding season this species may join a mixed flock of other insectivorous bird species to forage in dry woodlands and grasslands during the winter months. The Scarlet Robin can inhabit both mature and regrowth vegetation communities.	Bionet	Known to occur in Coco Creek subject site	Moderate
<i>Petroica phoenicea</i>	Flame Robin	V		The Flame Robin prefers open woodland habitats, breeding in upland tall moist eucalyptus forests with an open understory of native grasses. During winter the Flame Robin moves into drier more open habitats including pastures and native grasslands.	Bionet	Likely	Moderate
<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler	V		The Grey-crowned Babbler occupies Box-gum woodlands, Box-cypress-pine and Box Woodlands on alluvial plains. They construct several large dome stick nests within a territory and breed cooperatively during the warmer months.	Bionet	Likely	Moderate
<i>Polytelis swainsonii</i>	Superb Parrot	V	V	The Superb Parrot requires tree hollows to breed. They typically nest in colonies and return to the same location over generations. The closest known breeding colonies occur at Cowra. During the summer they return from wintering in northern NSW to breed, often in open box-woodland or isolated paddock trees. They may	PMST	Possible	Low

Scientific Name	Common name	BC Act	EPBC Act	Habitat	Source	Likelihood of Occurrence within the Study Area	Likelihood of impact within the Study Area
				forage in grassy box woodland up to 10km from the nesting site.			
<i>Rostratula australis</i>	Australian Painted Snipe	E	E	The Australian Painted Snipe occupies wetland and swamp habitats, preferring the fringes of swamps and dams with a cover of grasses, lignum or open timber. Breeding occurs anytime during spring and summer when conditions are favourable. It nests on the ground amongst tall vegetation.	PMST	Nil	Low
<i>Stagonopleura guttata</i>	Diamond Firetail	V	-	The Diamond Firetail tends to occur in proximity to watercourses building small dome nests in shrubs and dense foliage. It is found within Box-Gum Woodlands, Snow Gum Woodlands, open forests, mallee, Natural Temperate Grassland and in secondary grasslands derived from other communities. This species forages on grasses, forbs and insects along the ground.	Bionet	Known to occur in Coco Creek subject site	Moderate
<i>Tyto novaehollandiae</i>	Masked Owl	V		The Masked Owl distribution extends across eastern Australia occupying forest and open woodland with adjacent clearings. Lives in dry eucalypt forests and woodlands to 1100 m. The typical diet consists of tree-dwelling and ground mammals, particularly rats. Pairs have a large home-range of 500 to 1000 ha. This species roosts in large tree hollows, dense foliage, caves. Similarly nesting requires large tree hollows or caves.	Bionet	Likely	Moderate

Scientific Name	Common name	BC Act	EPBC Act	Habitat	Source	Likelihood of Occurrence within the Study Area	Likelihood of impact within the Study Area
<i>Tyto tenebricosa</i>	Sooty Owl	V		Occurs in rainforest, including dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests. Roosts by day in the hollow of a tall forest tree or in heavy vegetation; hunts by night for small ground mammals or tree-dwelling mammals such as the Common Ringtail Possum (<i>Pseudocheirus peregrinus</i>) or Sugar Glider (<i>Petaurus breviceps</i>). Nests in very large tree-hollows.	Bionet	Likely	Moderate
Fish							
<i>Maccullochella peelii</i>	Murray Cod	-	V	The Murray Cod is known to occur within the Macquarie River and Lachlan Rivers. They move upstream to breed in small, clear, rocky streams with a variety of riffle and pool structure. At other times of the year they occupy large, slow-flowing often silty rivers of the Murray-Darling Basin. During this time they prefer habitats that provide adequate shelter in the form of deep holes vegetative cover, snags and overhanging vegetation.	PMST	Unlikely	Low
<i>Macquaria australasica</i>	Macquarie Perch	V	E	This species of freshwater fish inhabits river and lake habitats, especially the upper reaches of rivers and their tributaries. Spawning occurs in spring and summer in shallow upland streams or flowing sections of river systems. This species is found in the upper reaches of the Lachlan, Murrumbidgee and Murray Rivers, and in parts of the Hawkesbury and Shoalhaven catchment	PMST	Unlikely	Low

Scientific Name	Common name	BC Act	EPBC Act	Habitat	Source	Likelihood of Occurrence within the Study Area	Likelihood of impact within the Study Area
				areas. The species requires clear water with deep, rocky holes with abundant cover (including aquatic vegetation, woody debris, large boulders and overhanging banks (DotE 2016c; DPI 2016b).			
<i>Maccullochella macquariensis</i>	Trout Cod	E	E	The Trout Cod is endemic to the Murray Darling River system. The closest record occurs from the Macquarie River dating from 2006. This species requires deep water habitat with plenty of cover and refuge including undercut banks, snags (large woody debris) and prefer waterways with relatively fast currents. They typically have small home ranges and remain in the same area.	PMST	Unlikely	Low
<i>Prototroctes maraena</i>	Australian grayling		V	It is a migratory species that spawns in the lower freshwaters of coastal rivers and spends approximately 6 months in coastal seas as larvae/juveniles before migrating back into freshwater rivers and streams where they remain for the rest of their lives. During the freshwater phase of the life cycle, Australian Grayling inhabit lower altitude reaches of both large rivers and smaller streams. Very little is known about the specific environmental requirements or habitats occupied during the estuarine or marine phase of the life-cycle as very few specimens have been collected.	PMST	Unlikely	Low

Scientific Name	Common name	BC Act	EPBC Act	Habitat	Source	Likelihood of Occurrence within the Study Area	Likelihood of impact within the Study Area
Insect							
<i>Paralucia spinifera</i>	Bathurst Copper Butterfly		V	This species tends to be restricted to elevations above 900m ² within the central tablelands of NSW feeding exclusively on Blackthorn (<i>Bursaria spinosa</i>).	PMST	Unlikely	Low
Mammals							
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	The Large-eared Pied Bat primarily roosts beneath cliff overhangs, within disused mine shafts and may use tree hollows. Only two maternity roosts are known to occur within NSW. This species requires a combination of sandstone cliff for roosting habitat adjacent to Box-Gum Woodland or riparian corridors to provide appropriate foraging grounds.	Bionet, PMST	Likely	Moderate
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V	E	The Spotted-tailed Quoll has been recorded across a variety of habitats including rainforest, heath, woodlands and riparian forests. They require den sites found amongst fallen logs, small caves, rocky outcrops or within tree hollows to shelter and breed. Females occupy home ranges up to 750 ha while males' territories can extend up to 3500 ha.	PMST, Bionet	Likely	Moderate
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V,P		Prefers moist habitats with trees taller than 20 m. This species generally roosts in eucalypt hollows and has also	Bionet	Likely	Moderate

Scientific Name	Common name	BC Act	EPBC Act	Habitat	Source	Likelihood of Occurrence within the Study Area	Likelihood of impact within the Study Area
				been found to roost under loose bark on trees or in buildings.			
<i>Miniopterus australis</i>	Little Bent-winged Bat	V,P		Prefers well timbered areas of moist eucalypt, rainforest and wet and dry sclerophyll forest. Distribution extends along East coast and ranges of Australia from Cape York in Queensland to Wollongong in NSW. Little Bentwing-bats roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats. They often share roosting sites with the Common Bentwing-bat and, in winter, the two species may form mixed clusters.	Bionet	Likely	Moderate
<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat	V,P		Caves are the primary roosting habitat for this species, but they may also use mines, stormwater outlets or tunnels and other man-made infrastructure. Eastern Bentwing-bats occur along the east and north-west coasts of Australia, hunting in forested areas, catching moths and other flying insects above the tree tops.	Bionet	Likely	Moderate
<i>Petauroides volans</i>	Greater Glider	P	V	Found in tall eucalypt forests and woodlands. This species is dependent on large tracts of undisturbed tall forest with suitably large nesting hollows. Each animal requires approximately 1.5 ha of land.	Bionet, PMST	Likely	Moderate

Scientific Name	Common name	BC Act	EPBC Act	Habitat	Source	Likelihood of Occurrence within the Study Area	Likelihood of impact within the Study Area
<i>Petaurus norfolcensis</i>	Squirrel Glider	V,P		This species inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas. Squirrel gliders prefer mixed species stands with a shrub or acacia midstorey and require abundant tree hollows for refuge and nest sites.	Bionet	Likely	Moderate
<i>Nyctophilus corbeni</i>	South-eastern Long eared Bat	V	V	The South-eastern Long-eared Bat is known to occur throughout a variety of habitat types including Box-Gum, Ironbark and cypress pine woodlands. It relies on tree hollows to roost and breed.	PMST	Unlikely	Low
<i>Phascolarctos cinereus</i>	Koala	V	V	The Koala occupies open eucalypt woodlands and forests feeding exclusively on preferred feed trees.	PMST, Bionet	Possible	Low
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby		V	The Brush-tailed Rock Wallaby is found in fragmented populations throughout the Great Dividing Range. They live on rocky escarpments, granite outcrops and cliffs, which have caves and ledges facing north for warmth. They graze on native grasses, foliage, fruits of shrubs, roots and bark found in surrounding habitat.	PMST	Unlikely	Low
<i>Pseudomys novaehollandiae</i>	New Holland Mouse		V	Known to inhabit open heathlands, woodlands and forests with a heathland understorey and vegetated sand dunes. It is a social animal, living predominantly in burrows shared with other individuals. Distribution is	PMST, Bionet	Possible	Low

Scientific Name	Common name	BC Act	EPBC Act	Habitat	Source	Likelihood of Occurrence within the Study Area	Likelihood of impact within the Study Area
				patchy in time and space, with peaks in abundance during early to mid stages of vegetation succession typically induced by fire.			
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	They Grey-headed Flying Fox roosts in conspicuous colonies often along watercourses. They forage on a range of fruits and blossoms travelling up to 50 km in an evening to feed.	Bionet, PMST	Likely	Low
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheathtail-bat	V		The Yellow-bellied Sheathtail Bat is found throughout south-east Australia. It roosts in tree hollows and buildings and occasionally in mammal burrows where roost sites area scarce. When foraging for insects, flies high and fast over the forest canopy, but lower in more open country. Breeding has been recorded from December to mid-March, when a single young is born.	Bionet	Likely	Moderate
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V		The Greater Broad-nosed Bat is a large powerful bat, up to 95 mm long, with a broad head and a short square muzzle that is found mainly in the gullies and river systems that drain the Great Dividing Range, from north-eastern Victoria to the Atherton Tableland. It extends to the coast over much of its range. Utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Roosts in tree hollows, but also found in buildings. Open woodland	Bionet	Likely	Moderate

Scientific Name	Common name	BC Act	EPBC Act	Habitat	Source	Likelihood of Occurrence within the Study Area	Likelihood of impact within the Study Area
				habitat and dry open forest suits the direct flight of this species as it searches for beetles and other large, slow-flying insects; this species has been known to eat other bat species.			
<i>Vespadelus troughtoni</i>	Eastern Cave Bat	V		The Eastern Cave Bat is found in a broad band on both sides of the Great Dividing Range from Cape York to Kempsey, with records from the New England Tablelands and the upper north coast of NSW. The western limit appears to be the Warrumbungle Range, and there is a single record from southern NSW, east of the ACT. A cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs; has been recorded roosting in disused mine workings, occasionally in colonies of up to 500 individuals. Occasionally found along cliff-lines in wet eucalypt forest and rainforest.	Bionet	Likely	Moderate
Reptiles							
<i>Aprasia parapulchella</i>	Pink-tailed Worm Lizard	V	V	Pink-tailed worm-lizard requires rocky outcrops or scattered partly buried rocks. It occurs under rocks in grassland and woodland in south-east Australia. It spends a considerable amount of time in burrows: the burrows have been constructed by, and may still by	PMST	Possible	Low

Scientific Name	Common name	BC Act	EPBC Act	Habitat	Source	Likelihood of Occurrence within the Study Area	Likelihood of impact within the Study Area
				inhabited by, small black ants or termites. It feeds on the larvae and eggs of ants.			
<i>Delma impar</i>	Striped Legless Lizard		V	The Striped Legless Lizard is a grassland specialist. Potential habitat for the Striped Legless Lizard includes all areas which have, or once had, native grasslands or grassy woodlands (including derived grasslands) across the historical range of the species, provided that area retains suitable tussock structure, the soil is of appropriate type and structure, and the site has not had major disturbance such as ploughing. All occupied sites have a grassy ground cover, often with a mixture of native and exotic perennial and annual species of tussock-forming grasses (often >20–50% cover). The species is now known to occur in some areas dominated by introduced species such as <i>Phalaris aquatica</i> , <i>Serrated Tussock</i> (<i>Nassella trichotoma</i>) and <i>Hypochaeris radicata</i> and at sites with a history of grazing and pasture improvement. Striped Legless Lizards shelter in grass tussocks, thick ground cover, soil cracks, under rocks, spider burrows, and under ground debris such as timber (Smith & Robertson 1999). The majority of sites in Victoria and NSW occur on cracking clay soils with some surface rock which provide shelter for the species.	PMST	Possible	Low

Scientific Name	Common name	BC Act	EPBC Act	Habitat	Source	Likelihood of Occurrence within the Study Area	Likelihood of impact within the Study Area
<i>Hoplocephalus bungaroides</i>	Broad-headed Snake		V	The Broad-headed Snake requires sandstone rock ledges and exfoliating sandstone refuge to shelter during autumn, winter, spring with nearby tree hollows to occupy over the summer months.	PMST, Bionet	Possible	Low
<i>Varanus rosenbergi</i>	Rosenberg's goanna	V		Individuals require large areas of habitat and are found in heath, open forest and woodland. This species is associated with termite mounds as they require these for nesting. Hollow logs, rock crevices and burrows (existing or new) are used for shelter.	Bionet	Possible	Low
Flora							
<i>Acacia bynoeana</i>	Bynoe's Wattle	E	V	Bynoe's wattle is found in central eastern NSW, from the Hunter District (Morisset) south to the Southern Highlands and west to the Blue Mountains. The species is currently known from about 30 locations, with the size of the populations at most locations being very small (1-5 plants). It has recently been found in the Colymea and Parma Creek areas west of Nowra. Occurs in heath or dry sclerophyll forest on sandy soils. Seems to prefer open, sometimes slightly disturbed sites such as trail margins, edges of roadside spoil mounds and in recently burnt patches	PMST	Possible	Low

Scientific Name	Common name	BC Act	EPBC Act	Habitat	Source	Likelihood of Occurrence within the Study Area	Likelihood of impact within the Study Area
<i>Cynanchum elegans</i>	White-flowered Wax Plant	E	E	Restricted to eastern NSW where it is distributed from Brunswick Heads on the north coast to Gerroa in the Illawarra region. The species has been recorded as far west as Merriwa in the upper Hunter River valley. Flowering occurs between August and May, with a peak in November. Flower abundance on individual plants varies from sparse to prolific.	PMST	Nil	Low
<i>Dicanthum setosum</i>	Bluegrass	V	V	Bluegrass occurs on the New England Tablelands, North West Slopes and Plains and the Central Western Slopes of NSW, extending to northern Queensland. It occurs widely on private property, including in the Inverell, Guyra, Armidale and Glen Innes areas. Flowering time is mostly in summer. Associated with heavy basaltic black soils and red-brown loams with clay subsoil. Often found in moderately disturbed areas such as cleared woodland, grassy roadside remnants and highly disturbed pasture. (Often collected from disturbed open grassy woodlands on the northern tablelands, where the habitat has been variously grazed, nutrient-enriched and water-enriched). It is open to question whether the species tolerates or is promoted by a certain amount of disturbance, or whether this is indicative of the threatening processes behind its depleted habitat.	PMST	Nil	Low

Scientific Name	Common name	BC Act	EPBC Act	Habitat	Source	Likelihood of Occurrence within the Study Area	Likelihood of impact within the Study Area
<i>Eucalyptus aggregata</i>	Black Gum		V	The Black Gum tends to grow on flats and in frost hollows on the lowest part of the landscape often adjacent to creeks and rivers. It occurs in open woodland with grassy understory but can also occur as isolated paddock trees in modified or exotic pastures. It is a cold adapted eucalypt and grows in associated with other similar cold adapted species i.e. <i>Eucalyptus pauciflora</i> , <i>E. viminalis</i> , <i>E. rubida</i> , <i>E. stellulata</i> and <i>E. ovata</i> .	PMST, Bionet	Possible	Low
<i>Eucalyptus cannonii</i>	Capertee Stringybark	V		Capertee Stringybark has a broad altitudinal range, from around 450m to 1,050m. Within this range, the species appears to tolerate most situations except the valley floors. Has a diverse range of associated eucalypt species. Mature trees survive hot fires. This species hybridises with other stringybarks, in particular, <i>Eucalyptus macrorhyncha</i> .	Bionet	Known to occur within Airly Creek Study Area.	Moderate
<i>Eucalyptus pulverulenta</i>	Silver-leaved Mountain Gum		V	The Silver-leaved Gum grows in shallow soils as an understorey plant in open forest, typically dominated by Brittle Gum (<i>Eucalyptus mannifera</i>), Red Stringybark (<i>E. macrorhyncha</i>), Broad-leaved Peppermint (<i>E. dives</i>), Silvertop Ash (<i>E. sieberi</i>) and Apple Box (<i>E. bridgesiana</i>). Sometimes planted as street trees or ornamental (in private gardens), this species is found in two quite	PMST	Possible	Low

Scientific Name	Common name	BC Act	EPBC Act	Habitat	Source	Likelihood of Occurrence within the Study Area	Likelihood of impact within the Study Area
				separate areas, the Lithgow to Bathurst area and the Monaro (Bredbo to Bombala).			
<i>Euphrasia arguta</i>			CE	Euphrasia arguta is a disturbance coloniser requiring some disturbance to allow germination to occur. This species is restricted to the Nundle State Forest but historically has been recorded along the plains and woodlands of Bathurst.	PMST	Nil	Low
<i>Grevillea obtusiflora</i>	Grey Grevillea	E	E	Subspecies obtusiflora is restricted to Clandulla State Forest near Kandos. Subspecies fecunda occurs in the Capertee Valley, north-west of Lithgow, and south into Gardens of Stone National Park. Subspecies obtusiflora occurs as scattered groups in the understorey of low open eucalypt forest at altitudes of around 730 metres above sea level. Subspecies obtusiflora flowers sparsely in winter and spring with flowering peaking in October. Fruits, seeds and seedlings have not been recorded, indicating that it may be wholly dependent on root suckering for reproduction. The flower shape indicates it is mainly pollinated by birds, with bees being potential secondary pollinators. Subpopulation structure and isolation may affect pollination within and between sub-populations to cause lack of fruit set. Other causes of failure to produce seed may be genetically influenced	Bionet, PMST	Likely	Low

Scientific Name	Common name	BC Act	EPBC Act	Habitat	Source	Likelihood of Occurrence within the Study Area	Likelihood of impact within the Study Area
<i>Haloragis exalata</i> <i>supsp. Exalata</i>	Wingless Raspwort	V	V	Square Raspwort occurs in 4 widely scattered localities in eastern NSW. It is disjunctly distributed in the Central Coast, South Coast and North Western Slopes botanical subdivisions of NSW. Square Raspwort appears to require protected and shaded damp situations in riparian habitats. Flowering specimens in NSW are recorded from November to January.	PMST	Nil	Low
<i>Haloragodendron lucasii</i>	Hal	E	E	The known locations of this species are confined to a very narrow distribution on the north shore of Sydney. Associated with dry sclerophyll forest. Reported to grow in moist sandy loam soils in sheltered aspects, and on gentle slopes below cliff-lines near creeks in low open woodland. Associated with high soil moisture and relatively high soil-phosphorus levels. Highly clonal, which implies the true population size may be considerably smaller than expected. Flowering occurs from August to November with fruits appearing from October to December. Has demonstrated an ability to resprout from its rootstock.	PMST	Nil	Low
<i>Homoranthus darwinoides</i>	Fairy Bells	V	V	Rare in the central tablelands and western slopes of NSW, occurring from Putty to the Dubbo district. It is found west of Muswellbrook between Merriwa and Bylong, and north of Muswellbrook to Goonoo SCA. The	PMST	Nil	Low

Scientific Name	Common name	BC Act	EPBC Act	Habitat	Source	Likelihood of Occurrence within the Study Area	Likelihood of impact within the Study Area
				species has been collected from Lee's Pinch, but not relocated at its original locality north of Mt Coricudgy above the headwaters of Widden Brook. Grows in in various woodland habitats with shrubby understoreys, usually in gravely sandy soils. Landforms the species has been recorded growing on include flat sunny ridge tops with scrubby woodland, sloping ridges, gentle south-facing slopes, and a slight depression on a roadside with loamy sand. Flowers in spring or from March to December.			
<i>Leionema sympetalum</i>	-	V	V	The Rylstone Bell is restricted to an area of western Wollemi National Park, from east of Rylstone to north of Glen Davis. Restricted to exposed rocky sandstone formations known as pagodas. The species occurs in dry sclerophyll forest and probably also occurs in open or closed heathland communities. The flowering period is recorded as winter to spring. The flower has a greenish yellow corolla that may be attractive to particular insect pollinators.	PMST, Bionet	Likely	Low
<i>Leucochrysum albicans subsp. tricolor</i>	Hoary Sunray		E	The Hoary Sunray occurs in a wide variety of grassland, woodland and forest habitats, generally on relatively heavy soils, often on roadsides. It requires bare ground and disturbance for germination. In NSW it currently occurs on the Southern Tablelands adjacent areas in an area roughly bounded by Albury, Bega and Goulburn,	PMST	Nil	Low

Scientific Name	Common name	BC Act	EPBC Act	Habitat	Source	Likelihood of Occurrence within the Study Area	Likelihood of impact within the Study Area
				with a few scattered localities know from beyond this region.			
<i>Olearia cordata</i>	-	V	V	A NSW endemic with a scattered distribution generally restricted to the south-western Hunter Plateau, eastern Colo Plateau, and the far north-west of the Hornsby Plateau near Wisemans Ferry east of Maroota. Most known populations occur within conservation reserves (Wollemi National Park, Yengo National Park and Wisemans Ferry Historic Site).Populations are typically small and scattered. Grows in dry open sclerophyll forest and open shrubland, on sandstone ridges. Flowers November to May, with seed released from February to May, depending on environmental factors. Seed is wind dispersed and may adhere to the fur of browsers such as wallabies	PMST	Nil	Low
<i>Persoonia marginata</i>	Clandulla Geebung	V	V	Occurs in the western blue mountains. Populations are largely disjunct and include Clandulla, Ben Bullen and Sunny Corner State Forests; isolated populations have also been recorded from Turon and Gardens of Stone National Parks. Grows on sandstone in woodland communities and dry sclerophyll forest.	Bionet, PMST	Likely	Low
<i>Pomaderris brunnea</i>	Rufous Pomaderris	E	V	Brown Pomaderris is found in a very limited area around the Colo, Nepean and Hawkesbury Rivers, including the Bargo area and near Camden. It also	PMST and one	Possible	Low

Scientific Name	Common name	BC Act	EPBC Act	Habitat	Source	Likelihood of Occurrence within the Study Area	Likelihood of impact within the Study Area
				occurs near Walcha on the New England tablelands and in far eastern Gippsland in Victoria. Brown Pomaderris grows in moist woodland or forest on clay and alluvial soils of flood plains and creek lines. Flowers appear in September and October.	Bionet record just outside the 10 km radius		
<i>Pomaderris cotoneaster</i>	Cotoneaster Pomaderris	E	E	Cotoneaster Pomaderris has a very disjunct distribution, being known from the Nungatta area, northern Kosciuszko National Park (near Tumut), the Tantawangalo area in South-East Forests National Park and adjoining freehold land, Badgery's Lookout near Tallong, Bungonia State Conservation Area, the Yerranderie area, Kanangra-Boyd National Park, the Canyonleigh area and Ettrema Gorge in Morton National Park. The species has also been recorded along the Genoa River in Victoria. Cotoneaster Pomaderris has been recorded in a range of habitats in predominantly forested country. The habitats include forest with deep, friable soil, amongst rock beside a creek, on rocky forested slopes and in steep gullies between sandstone cliffs.	PMST	Possible	Low
<i>Phebalium bifidum</i>	-	E		<i>Phebalium bifidum</i> is restricted to the Capertee Valley, south east of Kandos in the Sydney Basin bioregion, NSW. The species is extremely rare, in being known	Bionet	Possible	Low

Scientific Name	Common name	BC Act	EPBC Act	Habitat	Source	Likelihood of Occurrence within the Study Area	Likelihood of impact within the Study Area
				from only four disjunct sites from within the Valley. Phebalium bifidum is not known from any conservation reserve. Occurs in dry sclerophyll woodland or heath on structured loam soil; in most instances plants have been found on relatively flat ground on broad ridges and hill crests.			
<i>Prasophyllum sp. Wybong</i>	A leek orchid		CE	Endemic to NSW, it is known from near Ilford, Premer, Muswellbrook, Wybong, Yeoval, Inverell, Tenterfield, Currabubula and the Pilliga area. Most populations are small, although the Wybong population contains by far the largest number of individuals. Habitat occurs within open eucalypt woodland and grassland.	PMST	Possible	Low
<i>Prostanthera cryptandroides subsp. cryptandroides</i>	Wollemi Mint-bush	V	V	Occurs between Lithgow and Sandy Hollow in Wollemi and Gardens of Stone NP. Has different associations based on location.	Bionet, PMST	Likely	Low
<i>Prostanthera stricta</i>	Mount Vincent Mint-bush	V	V	<i>Prostanthera stricta</i> is often a locally dominant undershrub in heath or scrub communities along cliff edges, or as an understorey species within a range of open forest or tall open forest types, or in adjacent transitional communities. <i>Prostanthera stricta</i> grows in areas of both skeletal soil and on deeper, well-drained soil profiles in areas characterised by steep rocky sideslopes, cliff lines, sandstone platforms, or gentle	Bionet, PMST	Possible	Low

Scientific Name	Common name	BC Act	EPBC Act	Habitat	Source	Likelihood of Occurrence within the Study Area	Likelihood of impact within the Study Area
				slopes with exposed sandstone outcropping and is likely to be fire sensitive.			
<i>Pultenea glabra</i>	Smooth Bush-pea		V	All known populations occur within the Blue Mountains LGA, specifically the Katoomba-Hazelbrook and Mt Victoria areas. Occurs on sandstone derived soils in riparian or swamp habitat in the mid to upper altitudes	PMST	Nil	Low
<i>Pultenea sp. Genowlan Point</i>	Genowlan Point Pultenea	CE	CE	The species is restricted to an exposed rocky area within metres of a cliff edge. All plants occupy north-westerly aspects on skeletal soils, in some instances on narrow ledges below the cliff edge. The population is associated with open Eucalyptus sparsifolia forest with an open shrubby understorey including Persoonia longifolia, Isopogon dawsonii and <i>Leucopogon muticus</i> .	PMST, Bionet	Possible	Low
<i>Rhizanthella slateri</i>	Eastern Underground Orchid	V	E	Habitat requirements are poorly understood and no particular vegetation type has been associated with the species, although it is known to occur in sclerophyll forest. Highly cryptic given that it grows almost completely below the soil surface, with flowers being the only part of the plant that can occur above ground. Therefore usually located only when the soil is disturbed. Flowers September to November.	PMST	Possible	Low

Scientific Name	Common name	BC Act	EPBC Act	Habitat	Source	Likelihood of Occurrence within the Study Area	Likelihood of impact within the Study Area
<i>Swainsona recta</i>	Small Purple-pea		E	Grows in association with understorey dominants that include Kangaroo Grass <i>Themeda australis</i> , <i>Poa</i> tussocks <i>Poa</i> spp. and spear-grasses <i>Austrostipa</i> spp. Plants die back in summer, surviving as a rootstocks until they shoot again in autumn. Generally tolerant of fire.	PMST	Possible	Low
<i>Thesium australe</i>	Austral Toadflax		V	Austral Toad-flax is found in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands in grassland on coastal headlands or grassland and grassy woodland away from the coast. Australe Toadflax has been recorded from the Lithgow area to the east of Bathurst. This species does not tolerate high intensity grazing or dominate weeds such as Blackberry well. It occurs along coastal headlands or grassy woodland habitats inland. It is a root parasite plant with a strong association with Kangaroo Grass (<i>Themeda australis</i>).	PMST	Possible	Low
<i>Wollemia nobilis</i>	Wollemi Pine	CE	CE	Little is known about the ecology of this recently-discovered species; ecological research is currently ongoing. Occurs in warm temperate rainforest and rain forest margins in remote sandstone canyons. Seed is persistent in the canopy and most probably matures in autumn. The seed cones take 16 to 19	PMST	Possible	Low

Scientific Name	Common name	BC Act	EPBC Act	Habitat	Source	Likelihood of Occurrence within the Study Area	Likelihood of impact within the Study Area
				months to mature. Seeds are light and winged and most probably dispersed by wind.			
Endangered Ecological Communities							
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland		E	CE	White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland can occur as either grassland or woodland is characterised by a species diverse understory of grasses, herbs and sparse shrubs. Dominant canopy species include Eucalyptus albens, E. melliodora and E. blakelyi.	PMST	Known - Aligns with PCT 268, 281 Airly, Coco	Moderate
Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion		E		Associated with high altitudes on volcanic substrates with high rainfall which support the growth of tall trees and softer plants that are characteristic of this community. The UBEF ecological community occurs in parts of the Blue Mountains, Southern Highlands, and Southern Tablelands, roughly between the localities of Denman, to the north, and Yabboro, to the south. The ecological community is mostly within the Sydney Basin bioregion. Some patches of its eastern edge may extend into the nearby South East Highlands bioregion.	PMST	Possible	Low
Natural Temperate Grassland of the South Eastern Highland			CE	There are eight distinct associations within the community (plant communities r1 to r8). Floristics and	PMST	Possible	Low

Scientific Name	Common name	BC Act	EPBC Act	Habitat	Source	Likelihood of Occurrence within the Study Area	Likelihood of impact within the Study Area
				information on distribution are described in detail in Armstrong (et al., 2013).			
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland		E	CE	White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland can occur as either grassland or woodland is characterised by a species diverse understory of grasses, herbs and sparse shrubs. Dominant canopy species include Eucalyptus albens, E. melliodora and E. blakelyi.	PMST	Known - Aligns with PCT 268, 281. Airly, Coco	Moderate

Table 21 Migratory species likelihood of occurrence table

Scientific Name	Common Name	Comm. status	Habitat Association	Nature of Records	Likelihood of occurrence within subject site
Migratory Terrestrial					
<i>Actitis hypoleucos</i>	Common Sandpiper	-	In Australia, the Common Sandpiper is found in coastal or inland wetlands, both saline or fresh. It is found mainly on muddy edges or rocky shores. During the breeding season in the northern hemisphere, it prefers freshwater lakes and shallow rivers.	Species or species habitat may occur within area.	Nil
<i>Apus pacificus</i>	Fork-tailed Swift	-	Spends most of their time in the air and roosts on cliffs or walls.	Species or species habitat likely to occur within area.	Possible
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	-	The Sharp-tailed Sandpiper prefers the grassy edges of shallow inland freshwater wetlands. It is also found around sewage farms, flooded fields, mudflats, mangroves, rocky shores and beaches. Its breeding habitat in Siberia is the peat-hummock and lichen tundra of the high Arctic.	Species or species habitat may occur within area.	Nil
<i>Calidris ferruginea</i>	Curlew Sandpiper	CE	The Curlew Sandpiper is found on intertidal mudflats of estuaries, lagoons, mangroves, as well as beaches, rocky shores and around lakes, dams and floodwaters. Its breeding habitat is the lowland tundra of Siberia	Species or species habitat may occur within area.	Nil

Scientific Name	Common Name	Comm. status	Habitat Association	Nature of Records	Likelihood of occurrence within subject site
<i>Calidris melanotos</i>	Pectoral Sandpiper	-	These birds forage on grasslands and mudflats, picking up food by sight, sometimes by probing. They mainly eat arthropods and other invertebrates. Some Asian breeders winter in southern Australia and NZ.	Species or species habitat may occur within area.	Nil
<i>Gallinago hardwickii</i>	Latham's Snipe	-	Latham's Snipe are seen in small groups or singly in freshwater wetlands on or near the coast, generally among dense cover. They are found in any vegetation around wetlands, in sedges, grasses, lignum, reeds and rushes and also in saltmarsh and creek edges on migration. They also use crops and pasture.	Species or species habitat known to occur within area.	Nil
<i>Hirundapus caudacutus</i>	White-throated Needletail	V	Recorded along NSW coast to the western slopes and occasionally from the inland plains. Breeds in northern hemisphere. Almost exclusively aerial while in Australia. Occur above most habitat types, but are more frequently recorded above more densely vegetated habitats (rainforest, open forest and heathland) than over woodland or treeless areas.	Species or species habitat known to occur within area.	Nil
<i>Myiagra cyanoleuca</i>	Satin Flycatcher	-	In NSW widespread on and east of the Great Divide, sparsely scattered on the western slopes, very occasional records on the western plains. Inhabit heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, often near wetlands and watercourses. On migration, occur in coastal forests, woodlands, mangroves and drier woodlands and open forests. Generally, not in rainforests.	Breeding known to occur within area.	Possible

Scientific Name	Common Name	Comm. status	Habitat Association	Nature of Records	Likelihood of occurrence within subject site
<i>Monarcha melanopsis</i>	Black-faced Monarch	-	The Black-faced Monarch is found in rainforests, eucalypt woodlands, coastal scrub and damp gullies. It may be found in more open woodland when migrating.	Species or species habitat known to occur within area	Possible
<i>Motacilla flava</i>	Yellow Wagtail	-	The Yellow Wagtail is a rare visitor to Australia and may be recorded as a vagrant on occasion.	Species or species habitat may occur within area.	Nil
<i>Numenius madagascariensis</i>	Eastern Curlew	CE	The Eastern Curlew is found on intertidal mudflats and sandflats, often with beds of seagrass, on sheltered coasts, especially estuaries, mangrove swamps, bays, harbours and lagoons. It is rarely found inland. The Eastern Curlew occurs only in our flyway, and about 75 per cent of the world's curlews winter in Australia.	Species or species habitat may occur within area.	Nil
<i>Pandion haliaetus</i>	Osprey	-	Eastern Ospreys occur in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands. They are mostly found in coastal areas but occasionally travel inland along major rivers, particularly in northern Australia (Johnstone & Storr 1998; Marchant & Higgins 1993; Olsen 1995). They require extensive areas of open fresh, brackish or saline water for foraging (Marchant &	Species or species habitat may occur within area	Unlikely

Scientific Name	Common Name	Comm. status	Habitat Association	Nature of Records	Likelihood of occurrence within subject site
			Higgins 1993). They frequent a variety of wetland habitats including inshore waters, reefs, bays, coastal cliffs, beaches, estuaries, mangrove swamps, broad rivers, reservoirs and large lakes and waterholes		
<i>Rhipidura rufifrons</i>	Rufous Fantail	M; Marine	Found along NSW coast and ranges. Inhabits rainforest, dense wet forests, swamp woodlands and mangroves. During migration, it may be found in more open habitats or urban areas.	Species or species habitat known to occur within area.	Nil

Appendix E – NSW Tests of Significance

TESTS OF SIGNIFICANCE FOR STATE LISTED THREATENED BIOTA

Section 1.7 of the EP&A Act lists considerations that must be taken into account in the determination of the significance of potential impacts of a proposed Proposal on ‘threatened species, populations or ecological communities (or their habitats)’ listed under the BC Act. The Test of Significance is used to determine whether a Proposal is ‘likely’ to impose ‘a significant effect’ on threatened biota and thus whether a Species Impact Statement (SIS) is required. Should the Test of Significance conclude that there is likely to be a ‘significant effect’ on a listed species, population or endangered ecological community, an SIS must be prepared or participation in the Biodiversity Offset Scheme.

Biodiversity Conservation Act 2016 Part 7.3 sets out the following Test of Significance considerations which must be addressed to determine whether a significant impact is likely to occur.

The following species are all listed under the BC Act and have been assessed:

Name	BC Act	Summary of Assessment of Significance
Frogs		
<i>Litoria booroolongensis</i>	E	No significant impact
<i>Mixophyes balbus</i>	E	No significant impact
Woodland Birds		
<i>Artamus cyanopterus cyanopterus</i> , <i>Callocephalon fimbriatum</i> , <i>Calyptorhynchus lathamii</i> , <i>Chthonicola sagittata</i> , <i>Climacteris picumnus</i> , <i>Daphoenositta chrysopterus</i> , <i>Glossopsitta pusilla</i> , <i>Melanodryas cucullata cucullata</i> , <i>Melithreptus gularis gularis</i> , <i>Neophema pulchella</i> , <i>Petroica boodang</i> , <i>Petroica phoenicea</i> , <i>Pomatostomus temporalis temporalis</i> , <i>Stagonopleura guttata</i>	V	No significant impact
<i>Anthochaera phrygia</i>	CE	No significant impact
<i>Lathamus discolor</i>	E	No significant impact
Bats, Owls and Gliders		
<i>Falsistrellus tasmaniensis</i> , <i>Miniopterus australis</i> , <i>Miniopterus orianae oceanensis</i> , <i>Saccolaimus flaviventris</i> , <i>Scoteanax rueppellii</i> , <i>Vespadelus troungtoni</i> , <i>Ninox connivens</i> , <i>Tyto novaehollandiae</i> , <i>Tyto tenebricosa</i> , <i>Petaurus norfolcensis</i>	V	No significant impact

Name		BC Act	Summary of Assessment of Significance
Mammals			
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V	No significant impact
Plants			
<i>Eucalyptus cannonii</i>	Capertee Stringybark	V	No significant impact
Ecological communities			
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland		CE	No significant impact

Booroolong Frog – *Litoria booroolongensis* and Stuttering Frog – *Mixophyes balbus* - Endangered

Determining whether proposed development or activity likely to significantly affect threatened species or ecological communities, or their habitats

The Booroolong frog is restricted to NSW and north-eastern Victoria at 200 – 1300 m above sea level and is rare throughout most of the remainder of its range (OEH, 2018). The Booroolong frog is listed as being endangered and has disappeared from more than 50% of its historical range since the 1990's (Heatwole et al. 1995, Gillespie and Hines 1999). Persistent populations of this species have been identified in the Namoi catchment, however their extent remains unknown (OEH 2018).

Adults of this species live along permanent streams with some fringing vegetation cover and on or near cobble banks and other rock structures (Anstis et al., 1998). Basking occurs on rocks near the waters edge. Riffle, slow moving water over rocks is required by this species and females deposit eggs in shallow isolated pools or within rock crevices of slow moving streams.

The dispersal distance and non-breeding habitats for the Booroolong frog are unknown (DotE, 2016) but released frogs were recorded moving less than 50 m within a season (Hunter, 2011) to a maximum of 300 m distance covered between seasons (DotE, 2016).

The Stuttering Frog (*Mixophyes balbus*) occurs in eastern-flowing streams of the Great Dividing Range, between the Cann River catchment in East Gippsland, Victoria, and the Clarence River catchment in northeastern NSW (Figure 1), in the NSW North Coast, New England Tableland, Sydney Basin, South Eastern Highlands and South East Corner IBRA Bioregions (sensu DEH 2000). In the south of its range, the species occurs from near sea level to 1,100 m ASL, whilst in the north of its range it occurs above 200 m to 1,420 m ASL (Gillespie & Hines 1999; NSW Wildlife Atlas). Virtually the entire range of the Stuttering Frog is in NSW, with the few Victorian records from the far east of the State, just south of the NSW border.

Threats: chytrid fungus, modification and loss of streamside habitat, changes in hydrology, pesticides and herbicides, introduced fish, drought, introduced trees (increased canopy cover – change in microhabitat)

Neither of these species were detected on any of the three sites during targeted surveys. Surveys were conducted according to BC Act guidelines and within ideal weather conditions. Bridge works are also planned to be undertaken in winter, outside key breeding times for both species. Therefore, it is deemed unlikely that these species will be impacted by the proposed works.

In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

Targeted surveys were completed for these species in the correct season and conditions conducive to detection if present. No sign of these species was recorded over four (4) survey nights and as such, it is unlikely that a viable local population will be impacted.

Potential risks to these and other amphibians remain:

- Fine sediments washed or blown into river, filling rocky crevices used for shelter and breeding and reducing the food availability for tadpoles (Gillespie 2000).
- Introduction of Chytrid fungus by workers and equipment
- destruction/pollution of habitat due to chemicals and other substances used as part of construction
- Direct impact due to construction within/across waterway and/or tributaries
- Introduction of weeds/predators
- Disturbance to breeding pattern/tadpole survival due to timing of construction in peak breeding season.
- Flow on effects from works carried out upstream

In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable to this threatened species.

In relation to the habitat of a threatened species or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,

Targeted frog surveys were undertaken to assess the likely impact to aquatic habitats and fauna. No threatened frog species were found to occur, however six (6) amphibian species were found to be utilising the three sites during surveys (Table 10). Yabbies and a freshwater turtle were also observed utilizing aquatic habitat within the subject sites and study areas.

The bridge upgrades require the installation of new pilons, which will be drilled into the streambed. As a result, works are expected to impact the streambeds of all three creeks and will require diversion of water if creeks are flowing at the time of the surveys. Frogs were found to occur within all three study areas during surveys, with evidence of yabby also present at Crown Creek.

Airly Creek contains pools and healthy fringing vegetation and rocky banks upstream and downstream from the bridge, with some areas of these occurring within the subject site, and steep embankments either side of the bridge. Impacts to these habitats are likely to be contained to beneath the bridge, however runoff and sedimentation downstream from the works may occur.

Coco Creek is wide within the study area with a rocky streambed and Casuarina along the water's edge. Water was slowly flowing and pooled in some areas at the time of survey and rubbish was observed in and around the waterway. Impacts to the stream bed include the removal of Casuarina stems and possible runoff and sedimentation downstream.

Crown Creek contained the least amount of water, with the aquatic habitat limited to pools of water upstream and downstream of the site and a narrow slow flowing stream under the bridge. Aquatic habitats for this site were largely degraded and further impacts to the stream are likely to be contained to existing impacted areas, with possible runoff and sedimentation downstream if water is present during construction.

The vegetation to be impacted is mostly regrowth and established vegetation along an existing road, which is unlikely to be preferred habitat for any frog species. A total of **0.5 ha** across all three sites of native vegetation may potentially be directly impacted and an additional **12.9 ha** may be subject to indirect impacts such as noise and dust during construction.

Total potential direct impact, which includes riparian and instream habitat is:

- **Airly Creek crossing: 67 m by 25 m area**
- **Coco Creek crossing: 76 m by 25 m area**
- **Crown Creek crossing: 68 m by 38 m area**

There is over **22, 186 ha** of contiguous, high-quality habitat within the immediate surrounding areas (within 10 km), made up of National Parks and conservation areas.

The area to be cleared will not create new fragmentation or isolation and is not of high value to the long-term survival of the abovementioned species as it forms a small section of habitat within the wider locality and its position (along an existing road/bridges) is not considered preferred habitat for these frogs.

Although it may cause temporary disruption through indirect impacts, the removal of a proportionally small area of potential marginal habitat is unlikely to impact the long-term survival of these species as the vegetation to be removed occurs within an existing road corridor with existing disturbance and fragmentation issues, and there exists viable good quality habitat in the immediate vicinity of the study area. Additionally, important habitat features required by these species (riffle, cobbles, rocky breeding areas) will not be impacted.

The impact to important habitat is considered minor due to the works being an upgrade to already existing infrastructure and the availability of higher quality habitat within close proximity and in the surrounding locality. The sites did not contain preferred breeding habitat for these species.

Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),

The site does not support any declared registered areas of outstanding biodiversity value (formerly critical habitat).

<https://www.environment.nsw.gov.au/criticalhabitat/CriticalHabitatProtectionByDoctype.htm>

Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

The following listed Key threatening processes have the potential to increase as a result of the bridge upgrades if appropriate hygiene measures, erosion and sediment control and construction guidelines are not implemented and adhered to.

- Infection of frogs by amphibian chytrid causing the disease chytridiomycosis
- Invasion and establishment of exotic vines and scramblers.
- Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants.
- Anthropogenic climate change
- Clearing of native vegetation
- Invasion and establishment of the cane toad, *Bufo marinus*
- Predation by *Gambusia holbrooki* (plague minnow or mosquito fish)
- Removal of dead wood and dead trees

Conclusion

This project is not impacting any known Booroolong frog or Stuttering frog habitat directly and no evidence of these species was found at the time of targeted surveys. Indirect impacts from works may occur due to clearing, dust/sedimentation and increased vehicle traffic however if managed correctly with appropriate safeguards, these indirect impacts are unlikely to have an impact on this population.

Artamus cyanopterus cyanopterus, Callocephalon fimbriatum, Calyptorhynchus lathamii, Chthonicola sagittata, Climacteris picumnus, Daphoenositta chrysopterus, Glossopsitta pusilla, Melanodryas cucullata cucullata, Melithreptus gularis gularis, Neophema pulchella, Petroica boodang, Petroica phoenicea, Pomatostomus temporalis temporalis, Stagonopleura guttata, Anthochaera phrygia, Lathamus discolour

These birds have been grouped together based on similar habitat requirements occupying eucalypt forests and woodlands and their requirement to breed and / or roost within the study area.

In the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.

Woodland birds require open woodland and often tree hollows for roosting and nesting sites. Each species has specific requirements as to the location, type and size of these sites.

- **Regent Honeyeater:** The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Regent Honeyeaters inhabit woodlands that support a significantly high abundance and species richness of bird species. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes. There are three known key breeding areas, two of them in NSW - Capertee Valley and Bundarra-Barraba regions. The species breeds between July and January in Box-Ironbark and other temperate woodlands and riparian gallery forest dominated by River Sheoak. Regent Honeyeaters usually nest in horizontal branches or forks in tall mature eucalypts and Sheoaks. Also nest in *mistletoe haustoria* (OEH, 2021).
 - **Painted Honeyeater:** A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus *Amyema*. Nest from spring to autumn in a small, delicate nest hanging within the outer canopy of drooping eucalypts, she-oak, paperbark or mistletoe branches
 - **Grey-crowned Babbler:** Build and maintain several conspicuous, dome-shaped stick nests about the size of a football. A nest is used as a dormitory for roosting each night. Nests are usually located in shrubs or sapling eucalypts, although they may be built in the outermost leaves of low branches of large eucalypts. Nests are maintained year round, and old nests are often dismantled to build new ones. Breed between July and February.
 - **Black-chinned Honeyeater:** Breeds solitarily or co-operatively, with up to five or six adults, from June to December. The nest is placed high in the crown of a tree, in the uppermost lateral branches, hidden by foliage. It is a compact, suspended, cup-shaped nest
 - **Diamond Firetail:** Builds globular nests in dense shrubs or other protective areas (i.e. hawk / raven nests). Tends to nest in colonies between August and January. Species prefers to nest in dense foliage along watercourses.
 - **Brown Treecreeper:** Found in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey.
 - **Gang-gang Cockatoo:** Nests located in hollows that occur at least 9 m above the ground and which are 10 cm in diameter or larger.
-

- **Glossy Black-cockatoo**
- **Dusky Woodswallow:** May breed as a solitary pair or in a small flock. There is some indication that they exhibit breeding site fidelity. Nests in shrubs or low trees, living or dead, horizontal or upright forks in branches, spouts, hollow stumps or logs, behind loose bark or in a hollow in the top of a wooden fence post. Nest sites may be exposed or well concealed by foliage.
- **Speckled Warbler**
- **Flame Robin:** Breeds in upland tall moist eucalypt forests and woodlands, often on ridges and slopes. The groundlayer of the breeding habitat is dominated by native grasses and the shrub layer may be either sparse or dense.
- **Scarlet Robin:** The Scarlet Robin breeds on ridges, hills and foothills of the western slopes of the Great Dividing Range and eastern coastal regions. Pairs defend a breeding territory and mainly breed between the months of July and January building an open cup made of plant fibres and cobwebs and is built in the fork of tree usually more than 2 metres above the ground.
- **Hooded Robin:** Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. The nest is a small, neat cup of bark and grasses bound with webs, in a tree fork or crevice, from less than 1 m to 5 m above the ground.
- **Varied Sitella:** Builds a cup-shaped nest of plant fibres and cobwebs in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years.
- **Little Lorikeet:** Roosts in treetops, often distant from feeding areas. Nests in proximity to feeding areas if possible, most typically selecting hollows in the limb or trunk of smooth-barked Eucalypts. Nesting season from May to September. Entrance is small (3 cm) and usually high above the ground (2–15 m). These nest sites are often used repeatedly for decades, suggesting that preferred sites are limited. Riparian trees often chosen, including species like *Allocasuarina*.
- **Swift Parrot:** Migrate to the mainland between February and October to feed on flowering eucalypts. This species breeds in Tasmania between September and January.
- **Turquoise Parrot - Nests in tree hollows, logs or posts, from August to December.**

None of these species were recorded during the site inspection completed in September. The impact to each of the subject sites and study areas will be short (2 weeks each) and controlled and will take place outside of the breeding season (winter) for these species. There is potential for one (1) hollow bearing tree to be removed. The above-mentioned species are likely to occur surrounding the subject sites in the large tracts of suitable habitat. The subject sites are subject to traffic and disturbance and do not constitute important habitat for these species. The surrounding study areas potentially contain marginal breeding habitat for each of these species with foraging resources available throughout. No evidence of nesting by any of these species was observed during surveys within the subject sites. Large areas of high quality contiguous habitat are available outside and adjoining the study areas. Therefore it is considered unlikely the proposal would place a viable local population of any of these species at risk of extinction.

In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

One record of Regent Honeyeater occurs within the Coco Creek study area, however it is likely that the subject site is only transient habitat and does not constitute habitat considered critical for the survival of any local population of the abovementioned species. No breeding habitat was observed and the life cycle of these birds will not be impacted upon such that a viable local population is placed at risk of extinction.

In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

- (i) is likely to have an adverse effect on the extent of the ecological community such that its occurrence is likely to be placed at risk of extinction, or**
- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,**

Not applicable to these threatened species.

In relation to habitat of a threatened species, population or ecological community:

- (i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and**
- (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and**
- (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,**

The vegetation on all three sites to be impacted is comprised mostly of regrowth and minor established vegetation along an existing road edge and creek lines, which are unlikely to be preferred habitat for any species. Approximately three potential habitat trees and stags (over 50 cm DBH, with hollows) were recorded across the three subject sites. There is potential impact to one (1) hollow bearing tree. A total of **0.5 ha** of native vegetation may potentially be directly impacted and an additional **12.9 ha** may be subject to indirect impacts such as noise and dust during construction. No important habitat resources such as tree hollows will be removed, with over **22, 186 ha** of contiguous, high-quality habitat within the immediate surrounding areas (within 10 km), made up of National Parks and conservation areas.

The shrubby habitat / trees to be removed are likely to be utilised by these woodland birds for marginal foraging resources only due to their proximity to the road edge. The area to be cleared will not create new fragmentation or isolation for these highly mobile species. The habitat to be removed is not of high value to the long-term survival of the abovementioned species as it forms a small section of habitat within the wider locality and its position (along an existing road/bridges) is unlikely to be preferred habitat for these birds.

Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

The site does not support any declared critical habitat.

<https://www.environment.nsw.gov.au/criticalhabitat/CriticalHabitatProtectionByDoctype.htm>

Whether the actions proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

The proposal involves the clearing of a small quantity of native vegetation on each site including potential removal of one (1) hollow bearing tree which is inconsistent with recovery actions for these species.

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The following listed Key threatening processes have the potential to increase as a result of the proposal if appropriate measures are not implemented and adhered to.

- Loss of hollow bearing trees
- Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants.
- Anthropogenic climate change
- Clearing of native vegetation
- Removal of dead wood and dead trees

Conclusion

The proposed works are unlikely to significantly impact the abovementioned species of woodland birds given the minor proportion of marginal potential habitat to be removed within any given site, the preference by these species for particular roosting and nesting sites away from areas of high disturbance, and the abundance of suitable roosting and nesting sites in the locality.

Bats, Forest Owls and Gliders: Vulnerable

Falsistrellus tasmaniensis, Miniopterus australis, Miniopterus orianae oceanensis, Saccolaimus flaviventris, Scotenax rueppellii, Vespadelus troughtoni, Ninox connivens, Tyto novaehollandiae, Tyto tenebricosa, Petaurus norfolcensis

These species have been grouped together based on similar habitat requirements.

In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

The abovementioned species are known to occur within the surrounding locality and require hollows/ culverts/ shelters to roost and breed.

The Barking Owl, Sooty Owl and Masked Owl have records within the locality. These species of Owl generally require large hollows to roost. These species primarily feed within woodland areas and edges preying on small mammals and birds and will utilise roadside areas for easy passage and foraging opportunities.

The bat species known to occur within the locality have differing breeding strategies and require different resources, as outlined below.

- Eastern False Pipistrelle: Generally roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings
- Little Bent-winged Bat: Little Bentwing-bats roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats.
- Large Bent-winged Bat: Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures.
- Yellow-bellied Sheath-tail-bat: Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. Breeding occurs from December to mid March.
- Greater Broad-nosed Bat: Roosts in tree hollows but may utilise buildings/ bridges. Little is known of its reproductive cycle, however a single young is born in January; prior to birth, females congregate at maternity sites located in suitable trees
- Eastern Cave Bat: A cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs; has been recorded roosting in disused mine workings.

Squirrel gliders also require abundant tree hollows for refuge and nest sites.

The proposal involves the clearing of **0.5 ha** of native vegetation that contains one potential suitable tree hollow. The bridges themselves may provide shelter and roosting resources for bats, however, as the bridges are in use, the disturbance created by vehicles is likely to deter most individuals. No bats were observed roosting within any structures during surveys. Several mature hollow bearing trees were identified as occurring within the study areas, however most of the observed hollows were small (<15 cm diameter) limiting the type of species that can utilize these resources. However, these trees may provide roosting and breeding habitat for bats and other species at some stage in their life history as the trees mature and the hollows grow.

None of these species were recorded during the site inspection completed in September. The impact to each of the subject sites and study areas will be short (2 weeks each) and controlled and will take place outside of the breeding season (winter) for most species. There is potential for one (1) hollow bearing tree to be removed. The above-mentioned species are likely to occur surrounding the subject sites in the large tracts of suitable habitat. The subject sites are marginal and subject to traffic and disturbance and are unlikely to constitute important habitat. The study areas potentially contain marginal breeding habitat for each of these species, with ample foraging resources throughout.

Given the availability of high quality contiguous native vegetation surrounding all three study areas, and the small areas of regrowth vegetation to be impacted on each site, the proposal is deemed unlikely to place viable local populations of these owls, bats and glider at risk of extinction. Additionally, if appropriate mitigation measures are implemented as to the timing of works/tree removal, any potential impacts to these species are further reduced.

In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable to these threatened species.

In relation to the habitat of a threatened species or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,

Potential habitat for these species within the subject sites was limited to marginal foraging resources. The bridges, rocky outcrops and surrounding logs and loose bark provide potential marginal resources for these species.

The vegetation to be impacted is mostly regrowth and established vegetation along an existing road, which is unlikely to be preferred habitat for any species considering the large tracts of undisturbed vegetation in the locality. Approximately three (3) were recorded at the three subject sites and study areas with potential impact to one (1) hollow bearing tree. A total of **0.5 ha** across all three sites of native vegetation may potentially be directly impacted and an additional **12.9 ha** may be subject to indirect impacts such as noise and dust during construction. There is over **22, 186 ha** of contiguous, high-quality habitat within the immediate surrounding areas (within 10 km), made up of National Parks and conservation areas.

The area to be cleared will not create new fragmentation or isolation and is not of high value to the long-term survival of the abovementioned species as it forms a small section of habitat within the wider locality and its position (along an existing road/bridges) may not be preferred habitat for these elusive birds and mammals.

Although it may cause temporary disruption through indirect impacts, the removal of a proportionally small area of potential marginal habitat is unlikely to impact the long-term survival of these species as the vegetation to be removed occurs within an existing road corridor with existing disturbance and fragmentation issues, and there exists viable good quality habitat in the immediate vicinity of the study area.

Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),

The site does not support any declared registered areas of outstanding biodiversity value (formerly critical habitat):

Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

The following listed Key threatening processes have the potential to increase as a result of the road upgrade if appropriate safety measures are not implemented and adhered to.

- Loss of hollow bearing tree (1)
- Clearing of native vegetation
- Removal of dead wood and dead trees
- Invasion of plant communities by perennial exotic grasses
- Infection of native plants by *Phytophthora cinnamomi*.
- Introduction and establishment of Exotic Rust Fungi of the order Pucciniales, pathogenic on plants of the family Myrtaceae.

Conclusion

Given that only a proportionally small area of potential roosting or foraging habitat is to be removed (including bridges, vegetation, hollow) and the availability of other higher quality suitable habitat within the locality, the proposed works are unlikely to result in a significant impact on these species of Owls, glider and bats such that these species are placed at further risk of extinction. Indirect impacts need to be considered and will likely be the only disturbance for these species as a result of the Bridge works.

Spotted tailed quoll (*Dasyurus maculatus*)- Vulnerable

In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

Spotted tailed quoll were not recorded at the time of surveys, nor evidence of their presence, however historical records occur within the immediate locality and their presence is likely considering the habitat resources available. Quolls are mostly nocturnal but may hunt during the day. This species occupies large home ranges and is known to traverse their home ranges along densely vegetated creeklines, thus potentially passing through the study areas. Quolls use hollow-bearing trees, fallen logs, other animal burrows, small caves and rock outcrops as den sites. Some fallen logs, one wombat burrow and rocky outcrops were observed within the study areas, however these will remain largely untouched and the works are unlikely to place a viable local population at risk of extinction.

In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable to these threatened species.

In relation to the habitat of a threatened species or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,

The vegetation to be impacted is mostly regrowth and established vegetation along an existing road/bridge which is unlikely to be preferred habitat for any species considering the large tracts of undisturbed vegetation in the locality. A total of **0.5 ha** of native vegetation may potentially be directly impacted and an additional **12.9 ha** may be subject to indirect impacts such as noise and dust during construction. There is over 22, 186 ha of contiguous, high-quality habitat within the immediate surrounding areas (within 10 km), made up of National Parks and conservation areas. The potential quoll habitat in the study areas includes the creeklines (for travel), wombat burrow, hollow logs and rocky outcrops and the general landscape for hunting and nesting.

The area to be cleared will not create new fragmentation or isolation and is not of high value to the long-term survival of the abovementioned species as it forms a small section of habitat within the wider locality and its position (along an existing road/bridges) may not be preferred habitat for these nocturnal predators.

Although it may cause temporary disruption through indirect impacts, the removal of a proportionally small area of potential habitat is unlikely to impact the long-term survival of this species as the vegetation to be removed occurs within an existing road corridor with existing disturbance and fragmentation issues, and there exists viable good quality habitat in the immediate vicinity of the study area.

Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),

The site does not support any declared Areas of Outstanding Biodiversity Value (formerly critical habitat):

Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

The following Key Threatening Processes have the potential to increase as a result of the proposed road upgrade along Hill End Road if the appropriate measures are not implemented and adhered to:

- Loss of hollow bearing trees
- Bushrock removal
- Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants
- Clearing of native vegetation
- Removal of dead wood and dead trees
- Invasion of plant communities by perennial exotic grasses
- Infection of native plants by *Phytophthora cinnamomi*.
- Introduction and establishment of Exotic Rust Fungi of the order Pucciniales, pathogenic on plants of the family Myrtaceae.

Conclusion

The proposed works are unlikely to significantly affect the Spotted-tailed Quoll due to; the relatively small area of vegetation to be removed, the existing fragmentation and disturbance level within these areas of habitat, the availability of high-quality habitat in the immediate vicinity, and the highly-mobile and nocturnal habits of this species. No known breeding dens occur within the study areas. Temporary disruption caused by noise, dust and general construction crew presence may disrupt travel patterns, particularly as individuals use creeklines to travel through the landscape, however these are not expected to be significant enough to interfere with the recovery of this threatened species.

Capertee Stringybark (*Eucalyptus cannonii*) - Vulnerable)

In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction

The Capertee Stringybark is a site managed species with one Key Management Area (KMA) identified for the conservation and management of this species. The KMA is centred on the Capertee Valley north of Lithgow, extending from Windburndale National Park, through State Forest land, private and crown tenure through the towns of Capertee and Portland into the western boundary of Wollemi National Park. The Key Management Area is inclusive of the study area for this proposal.

In accordance with the objectives for this KMA, targeted field surveys were undertaken to confirm the presence of the species within the study areas. Where possible, samples including nuts and buds were collected for identification. One individual was confirmed to occur within the Study area of the Airly Creek site within PCT 323. An additional five (5) juvenile trees may exist within the subject site to the south of the bridge, however, no reproductive or identifying material was present in order to positively ID these plants. There is potential for direct impact to these five trees and indirect impact in the form of dust settling on leaves, however these impacts are unlikely to have an adverse effect on the life cycle of the Capertee Stringybark such that a viable local population is placed at risk of extinction given more of this species are likely to be present within the immediate locality, and direct impacts are unlikely.

In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

- (iii) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**
- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction**

Not relevant to this species

In relation to the habitat of a threatened species or ecological community:

- (iii) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and**
- (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and**
- (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality**

The proposal involves the upgrade/ replacement of three (3) wooden bridges. Up to **0.5 ha** of native vegetation may be directly impacted as a result of these works and five (5) juvenile (ID not confirmed) may be directly impacted at Airly Creek. One (1) mature Capertee Stringybark was recorded within the study area of Airly Creek may experience indirect impacts. The area of habitat to be removed

occurs along an existing road/ bridges and the works will not cause greater fragmentation or isolation of habitat. Dispersal for this species is unlikely to be disrupted by the existing road.

The removal of this potential habitat within the study area is unlikely to be important for the long-term survival of this species.

Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly)

The site does not support any declared registered areas of outstanding biodiversity value (formerly critical habitat):

<https://www.environment.nsw.gov.au/criticalhabitat/CriticalHabitatProtectionByDoctype.htm>

Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process

The following listed Key threatening processes have the potential to occur or increase as a result of the proposal, if appropriate mitigation measures are not implemented:

- Loss of hollow bearing trees
- Infection of native plants by *Phytophthora cinnamomic*.
- Introduction and establishment of exotic rust fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae.
- Anthropogenic climate change
- Invasion of native plant communities by exotic perennial grasses

Conclusion

One mature and five potential juvenile Capertee Stringybark were recorded during the field investigations within the Study area of Airly Creek. Based on the location, quality and area of vegetation to be cleared occurring along the existing road/bridge corridor, and the proposed application of strict mitigation measures during the construction phase of the proposal (pre-clearing surveys), it is unlikely that the proposal will have a significant impact on the Capertee Stringybark population present within the locality.

*White Box Yellow Box Blakely's Red Gum Woodland and Derived Native Grassland (Critically Endangered under BC Act) – **Box Gum Woodland**. Critically Endangered*

In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction

Not relevant to this community

In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

As the study area for the Proposal is split across three (3) discrete areas, impacts at each site are unique and separate. The two (2) PCTs which are considered analogous to the Box Gum Woodland TEC were identified at all three (3) bridge locations; Airly Creek and Coco Creek study areas supported PCT 268, and Crown Creek study area supports PCT 281.

The Airly Creek study area supports a patch of PCT 268 in degraded condition, which has been highly modified historically for the construction and maintenance of the bridge. The direct impacts to this PCT at Airly Creek bridge is a maximum of **0.09 ha** with an additional **0.55 ha** indirect impact anticipated. This PCT is not mapped as occurring in the locality, however onsite surveys confirmed presence along the riparian corridor, extending to the north and south beyond the study area.

Similarly, the study area at Crown Creek supports PCT 281 in degraded condition due to historical modification and vegetation removal for the construction of the bridge. The maximum area of PCT 281 to be directly impacted by the Proposal is **0.22 ha**.

The Proposal involves direct impact to the existing bridge footprints which includes direct impacts to approximately **0.34 ha** of BGW EEC. The study area (100 m buffer on each of the discrete subject sites) includes an additional **7.17 ha** of BGW EEC which will potentially be subject to indirect impacts as part of works, including dust settling and other air emissions, noise and vibration and other typical indirect impacts associated with construction activities. It is not considered likely that machinery movements, parking or other disturbances will extend throughout this area, due to the limited access of the sites, being located within existing road reserves.

Local occurrence of the BGW EEC is not likely to be placed at risk of extinction as a consequence of these works as the area to be removed constitutes only **4.33%** of the community within the locality (recorded within 500 m radius of each study area).

In relation to the habitat of a threatened species or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality

The proposal will involve removal of approximately **0.34 ha** of Box Gum Woodland in disturbed condition, as the current management regime for each site includes bridge management (e.g. tree trimming) and impacts by the existing road and bridge structures. The area of BGW present within each subject site occurs as regrowth roadside trees and riparian vegetation with minimal native understory due to historical clearing and disturbance regimes. It is connected to areas of intact BGW within the locality within adjacent National Parks estate.

The importance of this BGW to the long-term survival of the EEC in the locality is not high, given its disturbed nature. Existing land use and degradation of the site has resulted in weed infestation and changes to structure within the study area, and removal of a small proportion of this degraded woodland will not result in significant direct or indirect impacts to the surrounding vegetation, which is likely to be in significantly better condition. The surrounding area supports intact native vegetation throughout numerous protected areas.

Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly)

The site does not support any declared registered areas of outstanding biodiversity value (formerly critical habitat):

<https://www.environment.nsw.gov.au/criticalhabitat/CriticalHabitatProtectionByDoctype.htm>

Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process

The following listed Key threatening processes have the potential to occur or increase as a result of the proposal, if appropriate mitigation measures are not implemented:

- Infection of native plants by *Phytophthora cinnamomic*.
- Introduction and establishment of exotic rust fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae.
- Anthropogenic climate change
- Invasion of native plant communities by exotic perennial grasses

Conclusion

Based on the location, quality and area of BGW proposed to be cleared, the current disturbed state and management regime of the community on the sites, it is unlikely that the proposal will have a

significant impact on the BGW community present given large areas of higher quality BGW persisting within the broader study area and locality.

Appendix F- EPBC Act Significant Impact Criteria Assessments

Assessments of significance have been provided for threatened biota of concern to provide an indication of the potential level of impact of the proposal based on past records and habitats present. The following assessments have relied on species habitat information and records available via OEH Saving Our Species, DEE SPRAT profiles unless otherwise stated.

The following species listed under the EPBC Act are included in these assessments:

Name	EPBC Act	Summary of Assessment of Significance
<i>Litoria booroolongensis</i>	E	No significant impact
<i>Mixophyes balbus</i>	V	No significant impact
<i>Anthochaera Phrygia</i> , <i>Lathamus discolour</i>	CE	No significant impact
<i>Grantiella picta</i>	V	No significant impact
<i>Petauroides volans</i>	V	No significant impact
<i>Dasyurus maculatus</i>	E	No significant impact
<i>White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland</i>	CE	No significant impact

The Assessment of Significance concluded that a significant impact to these species is unlikely. Consequently, a Referral to the Minister is not warranted.

Booroolong Frog, *Litoria booroolongensis* – Endangered

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it would:

Lead to a long-term decrease in the size of a population of a species,

Unlikely, as no known population exists in the subject site. Records do occur within a 10 km radius of the sites, however the proposed works are not expected to impact on individuals or a population of Booroolong frog due to the nature and extent of the upgrades.

Reduce the area of occupancy of the species,

Unlikely, as the habitat to be removed would not form an important part of these species' distribution range. As there is already bridge infrastructure at each of the three sites and no presence was confirmed, the upgrade works are not expected to reduce the area of occupancy for this species.

The vegetation to be impacted is mostly regrowth and established vegetation along an existing road/bridge which is unlikely to be preferred habitat for any species considering the large tracts of

undisturbed vegetation in the locality. A total of **0.5 ha** of native vegetation may potentially be directly impacted and an additional **12.9 ha** may be subject to indirect impacts such as noise and dust during construction. There is over **22,186 ha** of contiguous, high-quality habitat within the immediate surrounding areas (within 10 km), made up of National Parks and conservation areas. Frogs are not likely to prefer the riparian and aquatic habitat that will be impacted, due to the disturbed nature of the sites and the lack of important habitat features.

Fragment an existing population into two or more populations,

Highly unlikely as the works only involve removal of a small area of potential habitat for this species. The upgrades will replace existing bridges and will only directly impact upon a total of **0.51 ha**, of which most is waterway, existing bridge infrastructure and regrowth vegetation. Targeted surveys did not find this species present at any of the bridge locations therefore fragmentation of an existing population is highly unlikely.

Adversely affect habitat critical to the survival of a species,

The proposal will require the removal of up to **0.51 ha** of native vegetation and occur across three waterways. The land to be cleared is directly adjacent an existing road at existing bridge crossings. The aquatic and riparian habitat to be impacted is not deemed critical to the survival of this species. Large tracts of suitable habitat occur within the broader locality. Therefore, the Proposal is unlikely to adversely affect habitat that is critical to the survival of this species.

Disrupt the breeding cycle of a population,

No evidence of breeding was found at the time of surveys which were carried out during the breeding season for this species and in the correct conditions. The works will be limited to a very small area at each site, under existing bridge infrastructure which is unsuitable breeding habitat as this species lays its eggs in submerged rock crevices and tadpoles grow in slow-flowing connected or isolated pools.

Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline,

Unlikely. The locality contains vast areas of potential habitat that would remain intact. Removal of a small area of potential, but low quality, habitat (<**0.51 ha**) will not cause the decline of the species.

Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat,

Unlikely. Appropriate hygiene protocols will be implemented to ensure weeds and exotic species are not introduced to site.

Introduce disease that may cause the species to decline,

Unlikely. Appropriate hygiene protocols will be implemented to ensure diseases are not introduced to site.

Interferes substantially with the recovery of the species.

As no known populations exist and no evidence was found to suggest Booroolong frogs use the subject sites, the works, which are seen to have minimal impact on potential habitat, are not considered to interfere with the recovery of the species.

Conclusion

It is unlikely that these species will be significantly impacted by the proposed works

Stuttering Frog, *Mixophyes balbus* – Vulnerable

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it would:

Lead to a long-term decrease in the size of an important population of a species,

Unlikely, as no known population exists in the subject site. Records do occur within a 10 km radius of the sites, however the proposed works are not expected to impact on individuals or a population of Stuttering Frog due to the nature and extent of the upgrades.

Reduce the area of occupancy of the species,

The vegetation to be impacted is mostly regrowth and established vegetation along an existing road/bridge which is unlikely to be preferred habitat for any species considering the large tracts of undisturbed vegetation in the locality. A total of **0.5 ha** of native vegetation may potentially be directly impacted and an additional **12.9 ha** may be subject to indirect impacts such as noise and dust during construction. There is over **22,186 ha** of contiguous, high-quality habitat within the immediate surrounding areas (within 10 km), made up of National Parks and conservation areas. Frogs are not likely to prefer the riparian and aquatic habitat that will be impacted, due to the disturbed nature of the sites and the lack of important habitat features.

Given the availability of large tracts of suitable habitat within the immediate study area and broader locality, it is deemed the Proposal is unlikely to reduce the area of occupancy of this species.

Fragment an existing population into two or more populations,

No known populations occur at the bridge locations and no evidence of presence was noted during surveys. The Proposal is deemed unlikely to fragment an existing population into two or more populations.

Adversely affect habitat critical to the survival of a species,

The land to be cleared is directly adjacent an existing road at existing bridge crossings. The aquatic and riparian habitat to be impacted is not deemed critical to the survival of this species. Large tracts of suitable habitat occur within the broader locality. Therefore, the Proposal is unlikely to adversely affect habitat that is critical to the survival of this species.

Disrupt the breeding cycle of a population,

No tadpoles or individuals were noted at the time of surveys. Eggs are laid on rock shelves or shallow riffles in small, flowing streams. Surrounding aquatic habitat is likely to be preferred by most species for breeding rather than a breeding site directly adjacent a used road. The breeding cycle is unlikely to be affected due to works as long as the Mitigation measures are strictly adhered to.

Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline,

Impact to the waterways and habitat directly underneath each bridge is anticipated, however the habitat to be impacted is not preferred or quality habitat and is highly unlikely to lead to a decline of this species.

Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat,

As long as mitigation measures are strictly adhered to, no invasive species are expected to become established as a result of the proposed works.

Introduce disease that may cause the species to decline,

No evidence of existing disease was present within the study area during surveys. The presence of machinery during construction works may introduce weeds, though are unlikely to introduce disease for this species as part of the proposed works. Appropriate hygiene protocols will be implemented to ensure weeds and exotic species are not introduced to site.

Interferes substantially with the recovery of the species.

No individuals of this species were recorded on site during surveys and the works are not impacting on important habitat for this species. Provided the works do not stray beyond the delineated study area and strict mitigation measures controlling the extent of clearing and onsite protocols are followed, this proposal is unlikely to substantially interfere with the recovery of this species.

Conclusion

Given the above, it is deemed unlikely that the stuttering frog will be significantly impacted by the proposed works.

Painted Honeyeater, *Grantiella picta* – Vulnerable

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it would:

Lead to a long-term decrease in the size of an important population of a species,

Several records for this species occur throughout the locality, however no important population is known to occur within the study area. Given the limited impact footprint in land adjacent a road, and indirect impacts occurring with mitigation measures in place, the proposal is not anticipated to impact significantly on this species.

Reduce the area of occupancy of the species,

The vegetation to be impacted is mostly regrowth and established vegetation along an existing road/bridge which is unlikely to be preferred habitat for any species considering the large tracts of undisturbed vegetation in the locality. A total of **0.5 ha** of native vegetation may potentially be directly impacted and an additional **12.9 ha** may be subject to indirect impacts such as noise and dust during

construction. There is over **22, 186 ha** of contiguous, high-quality habitat within the immediate surrounding areas (within 10 km), made up of National Parks and conservation areas.

Given the availability of large tracts of suitable habitat within the immediate study area and broader locality, it is deemed the Proposal is unlikely to reduce the area of occupancy of this species.

Fragment an existing population into two or more populations,

No known populations occur at the bridge locations and no evidence of presence was noted during surveys. This species is highly mobile and the Proposal is deemed unlikely to fragment an existing population into two or more populations.

Adversely affect habitat critical to the survival of a species,

The land to be cleared is directly adjacent an existing road at existing bridge crossings. Large tracts of suitable habitat occur within the broader locality. Therefore, the Proposal is unlikely to adversely affect habitat that is critical to the survival of this species.

Disrupt the breeding cycle of a population,

No nests or individuals were noted at the time of surveys. Over 22 thousand hectares of untouched vegetation occurs surrounding the subject site which is likely to be preferred by most species for breeding rather than a breeding site directly adjacent a used road. The breeding cycle is unlikely to be affected due to works as long as the Mitigation measures are strictly adhered to.

Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline,

Approximately **12.93 ha** of native vegetation occurs within the study areas, with the potential to be impacted by the proposed works. Of this, approximately **0.51 ha** of native vegetation may be directly impacted or removed, including mature trees and overstorey species, representing 3.81 % of the overall native vegetation present within the immediate study area and 0.002 % of the broader locality. The site connects well with broader extents of remnant vegetation, with over 22, 186 ha of remnant native vegetation in a 10 km radius, immediately adjacent the sites.

Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat,

The study area was observed to contain moderate weed levels during surveys. As long as mitigation measures are strictly adhered to, no invasive species are expected to become established as a result of the proposed works.

Introduce disease that may cause the species to decline,

No evidence of existing disease was present within the study area during surveys. The presence of machinery during construction works may introduce weeds, though are unlikely to introduce disease for this species as part of the proposed works.

Interferes substantially with the recovery of the species.

No individuals of this species were recorded on site during surveys and this is a highly mobile species. Only small areas of vegetation occurring along existing impacted areas will be removed. Large tracts of suitable habitat occur within the immediate vicinity. Provided the works do not stray beyond the delineated study area and strict mitigation measures controlling the extent of clearing and onsite protocols are followed, this proposal is unlikely to substantially interfere with the recovery of this species.

Conclusion

Given the above, it is deemed unlikely that Painted Honeyeater will be significantly impacted by the proposed works.

Swift Parrot – (*Lathamus discolor*), Regent Honeyeater – (*Anthochaera Phrygia*) Critically Endangered

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it would:

Lead to a long-term decrease in the size of a population of a species,

Records for Regent Honeyeater occur within Coco Creek Study area and records for Swift Parrot occur within Coco Creek and Crown Creek study areas. Due to the nature of the works, the small direct impact and the lack of impact to important habitat for these species, it is unlikely that the proposed works would lead to a decrease in the size of a population of the Swift Parrot or Regent Honeyeater.

Reduce the area of occupancy of the species,

Unlikely, as the habitat to be removed would not form an important part of these species' distribution range. These species occur and have been recorded in the surrounding landscape, however as the project is an upgrade (not a new installation), the works will not cause further reduction in habitat, and thus are unlikely to reduce the area of occupancy.

Fragment an existing population into two or more populations,

The proposed works only involve removal of a small area of potential habitat for these highly mobile species. Birds are highly mobile and the bridge upgrade works cover only a small area – not enough to cause fragmentation of habitat or affect occupancy and movement.

Adversely affect habitat critical to the survival of a species,

Winter foraging habitats are important for the Swift Parrot. The proposal will require the removal of up to **0.51 ha** of native vegetation including winter foraging resources. Despite this no habitat in the study area is deemed as critical habitat for the survival of these species.

Disrupt the breeding cycle of a population,

The Swift Parrot breeds in Tasmania over summer and is a nomadic forager to the mainland over the winter months. The proposal will not impact any breeding habitats. The Regent Honeyeater breeds between July and January in Box-Ironbark and other temperate woodlands and riparian gallery forest dominated by River Sheoak. A key breeding area, where the Regent Honeyeater is regularly recorded,

is in the Capertee Valley which occurs to the north west of the subject sites. Regent Honeyeaters usually nest in horizontal branches or forks in tall mature eucalypts and Sheoaks. Due to the quality, location and extent of habitat in the study area and the vast areas of suitable habitat in the locality, the proposal is not likely to disrupt the breeding cycle of a population as individuals are unlikely to choose the areas as preferred nesting locations.

Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline,

Unlikely. The locality contains vast areas of potential habitat that would remain intact. Removal of a small area of potential, but low quality, habitat (**0.51 ha**) is unlikely to contribute to the further decline of the species.

Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat,

Unlikely. Appropriate hygiene protocols will be implemented to ensure weeds and exotic species are not introduced to site.

Introduce disease that may cause the species to decline,

Unlikely. Appropriate hygiene protocols will be implemented to ensure diseases are not introduced to site.

Interferes substantially with the recovery of the species.

As no evidence was found to suggest that a Swift Parrot or Regent Honeyeater population regularly occurs on site (nesting or important habitat), the works, which are seen to have minimal impact on potential habitat, are not considered to interfere with the recovery of the species.

Conclusion

It is unlikely that these species will be significantly impacted by the proposed works. The habitat to be impacted upon does not constitute vital breeding or foraging habitat, and although these species may move through or exist transiently within and surrounding the subject sites, the upgrade works are considered minor and there exists vast tracts of suitable habitat within the surrounding locality.

Greater Glider, *Petauroides volans* – Vulnerable

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it would:

Lead to a long-term decrease in the size of an important population of a species,

Greater Gliders require large tree hollows for shelter and nesting, with each family group using multiple den trees within its home range. A single young is produced each year (Victorian Government, 2019). No records of Greater Glider exists within the study areas. The subject sites contain up to twenty-eight (28) habitat trees / stags with the majority of the hollows present at <15 cm diameter. The site contains good quality Eucalypt woodland, which provides suitable foraging material for this species.

No important population of Greater Glider is known to occur within 10 km of the study area, however suitable habitat for this species occurs throughout the study area and broader locality. With the removal of hollow-bearing trees and up to **0.51 ha** of Eucalypt woodland, some potential breeding/nesting and foraging habitat for this species is to be removed. However, given the small areas of vegetation to be removed in a largely contiguous patch of remnant vegetation, and the mobile nature of this species, the proposal is deemed unlikely to affect the life cycle of this species such that a viable Important population is likely to be placed at risk of extinction. Given the limited impact footprint in land adjacent a road, and indirect impacts occurring with mitigation measures in place, the proposal is not anticipated to impact significantly on this species.

Reduce the area of occupancy of the species,

No records of this species occur within the study areas. Approximately **Twenty-eight (28)** habitat trees /stags containing hollows will be removed within an estimated **0.51 ha** of native vegetation to be impacted. However, these hollows are unsuitable for Greater Glider use as their entrances are too small- but they have potential to become suitable over time. Given the relatively small area of potentially suitable habitat for this species to be impacted located adjacent a road reserve, and given the availability of large tracts of suitable habitat within the immediate study area and broader locality, it is deemed the Proposal is unlikely to reduce the area of occupancy of this species.

Fragment an existing population into two or more populations,

No known populations occur at the bridge locations and no evidence of presence was noted during surveys. This species is highly mobile and the Proposal is deemed unlikely to fragment an existing population into two or more populations.

Adversely affect habitat critical to the survival of a species,

The land to be cleared is directly adjacent an existing road and bridges. Large tracts of suitable habitat occur within the broader locality. Therefore, the Proposal is unlikely to adversely affect habitat that is critical to the survival of this species.

Disrupt the breeding cycle of a population,

The breeding cycle is unlikely to be affected due to works as long as the Mitigation measures are strictly adhered to. No suitable breeding hollows exist within the impact footprint.

Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline,

Approximately **12.93 ha** of native vegetation occurs within the study areas, with the potential to be impacted by the proposed works. Of this, approximately **0.51 ha** of native vegetation may be directly impacted or removed, including mature trees and overstorey species, representing 3.81 % of the overall native vegetation present within the immediate study area and 0.002 % of the broader locality. The site connects well with broader extents of remnant vegetation, with over 22, 186 ha of remnant native vegetation in a 10 km radius, immediately adjacent the sites.

Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat,

The study area was observed to contain moderate weed levels during surveys. As long as mitigation measures are strictly adhered to, no invasive species are expected to become established as a result of the proposed works.

Introduce disease that may cause the species to decline,

No evidence of existing disease was present within the study area during surveys. Mitigation measures have been stated to reduce the possibility of disease being introduced to the study area are a result of the proposed works. Therefore, as long as mitigation measures are strictly adhered to, no diseases are anticipated to become established as a result of the proposed works.

Interferes substantially with the recovery of the species.

No records for this species occur within the study area. No individuals of this species were recorded on site during surveys. Only small areas of vegetation occurring directly adjacent existing bridge structures will be removed. Large tracts of suitable habitat occur within the immediate vicinity. Provided the works do not stray beyond the delineated study area and strict mitigation measures controlling the extent of clearing and onsite protocols are followed, this proposal is unlikely to substantially interfere with the recovery of this species.

Conclusion

Given the above, it is deemed unlikely that Greater Glider will be significantly impacted by the proposed works.

Spotted Tailed-quoll (*Dasyurus maculatus*) - Endangered

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it would:

Lead to a long-term decrease in the size of a population of a species,

Unlikely, as no known population exists in the subject site. Records do occur within a 10 km radius of the sites, however the proposed works are not expected to impact on individuals or a population of spotted-tail quoll due to the nature and extent of the upgrades.

Reduce the area of occupancy of the species,

Unlikely, as the habitat to be removed would not form an important part of these species' distribution range. Disused wombat burrows, rocky crevices, outcrops and creeklines occur throughout the subject sites and these may be used as quolls move throughout the landscape. As there is already bridge infrastructure at each of the three sites, the upgrade works are not expected to reduce the area of occupancy for this species.

Fragment an existing population into two or more populations,

Highly unlikely as the works only involve removal of a small area of potential habitat for these highly mobile species. If a population of spotted tail quoll does occur permanently within the study areas and locality, the proposed works will not fragment any such population. The upgrades will replace existing bridges and will only directly impact upon a total of 0.51 ha, of which most is waterway, existing bridge infrastructure and regrowth vegetation. Quolls occupy vast home ranges and are not restricted or confined to any area that would be subject to fragmentation.

Adversely affect habitat critical to the survival of a species,

The proposal will require the removal of up to **0.51 ha** of native vegetation including some rocky areas, impact along creeklines and fallen logs. Despite this no habitat in the study area is deemed as critical habitat for the survival of these species.

Disrupt the breeding cycle of a population,

Quolls use hollow-bearing trees, caves, outcrops, fallen logs and the burrows of other animals as den sites. They have large home ranges and change dens frequently. Breeding season is between April – July. As the works will occur at existing bridge locations, replacing old bridges, the impact area is unlikely to affect any new potential quoll breeding resources.

Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline,

Unlikely. The locality contains vast areas of potential habitat that would remain intact. Removal of a small area of potential, but low quality, habitat (**0.51 ha**) will not cause the decline of the species.

Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat,

Unlikely. Appropriate hygiene protocols will be implemented to ensure weeds and exotic species are not introduced to site.

Introduce disease that may cause the species to decline,

Unlikely. Appropriate hygiene protocols will be implemented to ensure diseases are not introduced to site.

Interferes substantially with the recovery of the species.

As no known populations exist and no evidence was found to suggest Spotted-tailed quolls use the subject sites, the works, which are seen to have minimal impact on potential habitat, are not considered to interfere with the recovery of the species.

Conclusion

It is unlikely that these species will be significantly impacted by the proposed works

White Box-Yellow Box-Blakely's Red Gum Woodland and Derived Grassland - Critically Endangered

An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will

Reduce the extent of an ecological community

The proposal will involve removal of approximately **0.34 ha** of Box Gum Woodland in heavily disturbed condition, as the current management regime for each site includes bridge management (e.g. tree trimming) and fragmentation by the existing road and bridge structures.

Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines

The area of BGW present within each subject site occurs as remnant roadside trees and riparian vegetation with minimal native understory due to historical clearing and disturbance regimes. It is connected to areas of intact BGW within the locality within adjacent National Parks estate. No further fragmentation will occur – the surrounding vegetation is already bisected by Glen Davis Road.

Adversely affect habitat critical to the survival of an ecological community

The area to be impacted occurs as impacted/ disturbed vegetation surrounding three (3) bridges. It is not likely to be habitat that is critical to the survival of this ecological community.

Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns

Works will temporarily impact on water flow within Airly, Coco and Crown Creeks during construction, however these temporary diversions will not impact on the EEC. Construction is being undertaken to have minimal impact on the surrounding environment, with habitat trees and surrounding vegetation left untouched wherever possible. Cranes will be used to minimise impact and need to enter vegetated areas.

Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting

Once operational, no further impacts to surrounding vegetation are predicted as part of the bridge upgrades.

Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:

- assisting invasive species, that are harmful to the listed ecological community, to become established, or
 - causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community
-

The works will have minimal impact on the EEC during construction, with much of the work able to be completed in an already impacted area or from the road, using a crane. No fertilisers, oils, weeds or other pollutants will impact on the EEC as strict hygiene protocols will be followed by construction crews.

Interfere with the recovery of an ecological community. Reduce the extent of an ecological community

Although a small reduction (up to **0.34 ha**) may occur as a result of the proposed upgrades in total across all three sites, this will impact on already impacted, regrowth vegetation. The importance of this BGW to the long-term survival of the EEC in the locality is not high, given its disturbed nature and proximity to the road and ongoing disturbance. Existing land use and degradation of the site has resulted in lower diversity and ecological complexity and higher weed encroachment within the subject sites, and removal of a small proportion of this degraded woodland is unlikely to result in significant direct or indirect impacts to the surrounding vegetation which is in varying conditions. The surrounding locality supports intact native vegetation throughout numerous protected areas which may support larger tracts of this TEC.

Marrangaroo, New South Wales
September 2021 Daily Weather Observations[illegible]

Marrangaroo, New South Wales

November 2021 Daily Weather Observations



Australian Government
Bureau of Meteorology

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C					km/h	local	°C	%	eighths		km/h	hPa	°C	%	eighths		km/h	hPa
1	Mo	2.5	18.6	0			NNW	19	10:48	11.0	81			Calm		17.8	50		NW	7	
2	Tu	3.7	19.6	0			E	30	14:29	14.1	64		ENE	9		18.0	50		SE	11	
3	We	5.0	21.6	0			ENE	20	19:15	15.0	67		ENE	6		20.7	43		N	6	
4	Th	12.5	15.7	7.8			ENE	22	20:24	13.6	95			Calm		15.1	82		N	6	
5	Fr	11.4	16.2	19.6			E	30	09:18	12.3	87		ENE	15		15.3	87		ENE	6	
6	Sa	10.3	21.9	2.4			NNW	22	13:03	15.5	68		NNW	6		19.8	55		NNW	11	
7	Su	10.4	19.8	7.6			E	28	07:41	14.7	89		NE	7		19.2	74		NNW	9	
8	Mo	11.8	21.6	27.6			SW	35	10:41	15.5	81		WSW	2		20.0	51		SW	13	
9	Tu	8.7	22.4	0			WSW	30	13:28	16.1	69		NNW	9		21.2	43		WSW	11	
10	We	11.2	18.4	0			NNW	26	08:42	16.6	82		N	11		15.6	94		ENE	2	
11	Th	12.5	20.7	21.2			ESE	28	17:18	18.2	78		NW	6		17.1	85		ENE	7	
12	Fr	8.2	19.4	35.6			WNW	48	16:35	12.4	88		NNW	2		17.2	75		WNW	15	
13	Sa	6.2	9.8	4.6			W	52	17:23	7.6	87		WNW	19		9.0	86		WNW	15	
14	Su	4.2	13.4	0.6			WNW	46	08:27	9.0	64		WNW	17		10.9	65		NW	13	
15	Mo	4.9	12.2	4.4			WSW	52	08:49	6.4	69		W	19		10.9	58		W	19	
16	Tu	4.4	15.6	0			SW	35	07:48	10.4	58		SW	17		14.3	49		SW	9	
17	We	2.8	18.0	0			ENE	22	18:40	10.1	73		NNE	7		15.8	49		NNE	6	
18	Th	6.2	22.7	0			NNW	24	08:55	16.4	54		NNE	7		21.2	40		WNW	7	
19	Fr	12.2	22.6	0			NNW	26	05:56	18.1	53		WNW	11		21.4	45		WNW	9	
20	Sa	13.4	22.8	0			WNW	43	14:45	20.8	47		WNW	13		19.6	62		W	19	
21	Su	10.8	12.6	10.2			ESE	41	18:34	11.0	91		ESE	6		11.3	89		SE	13	
22	Mo	9.3	15.0	4.0			SSE	37	00:09	10.5	85		SE	11		12.9	74		ESE	13	
23	Tu	9.8	17.9	1.0			E	19	08:00	13.1	84		ENE	9		17.5	71		E	9	
24	We	13.1	23.1	0.2			N	20	15:07	17.0	83		NW	6		20.8	68		NNE	6	
25	Th	16.0	19.7	0.8			NNW	19	09:27	17.5	87		N	4		17.8	87		N	6	
26	Fr	13.2	15.1	24.4			SSE	46	22:12	14.0	91		SSE	6		13.5	90		SE	17	
27	Sa	8.7	12.8	13.6			SE	43	02:20	10.2	91		SE	15		11.2	84		SE	7	
28	Su	7.9	14.2	0.8			SSE	26	23:02	9.6	87		ESE	7		12.8	76		E	11	
29	Mo	8.5	19.2	0			NNW	15	12:28	12.3	80		NE	4		16.7	76		NW	6	
30	Tu	11.2	21.3	0.2			NE	22	18:38	15.9	81			Calm		19.9	64		ENE	7	
Statistics for November 2021																					
Mean		9.0	18.1							13.5	77			8		16.5	67			9	
Lowest		2.5	9.8							6.4	47			Calm		9.0	40		ENE	2	
Highest		16.0	23.1	35.6			#	52		20.8	95		#	19		21.4	94		W	19	
Total				186.6																	

Observations were drawn from Marrangaroo (Defence) (station 063308)

IDCJDW2110.202111 Prepared at 13:00 UTC on 2 Dec 2021

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<http://www.bom.gov.au/climate/dwo/IDCJDW0000.pdf>

Marrangaroo, New South Wales

December 2021 Daily Weather Observations



Australian Government
Bureau of Meteorology

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C					km/h	local	°C	%	eighths		km/h	hPa	°C	%	eighths		km/h	hPa
1	We	14.0	22.1	0			ESE	20	13:36	18.8	72		ENE	6		21.0	64		E	6	
2	Th	9.8	25.0	9.4			SSE	31	15:20	18.2	70		ENE	4		24.8	52		E	7	
3	Fr	11.4	28.5	0			E	30	15:41	21.5	63		WNW	6		27.9	39		WSW	7	
4	Sa	14.3	23.5	0			SW	31	13:52	19.0	71		W	6		22.5	29		SW	13	
5	Su	9.5	14.6	0			SE	35	00:11	10.3	90		E	9		13.2	84		ESE	9	
6	Mo	9.0		0.4						12.2	72		NE	9							
Statistics for the first 6 days of December 2021																					
Mean		11.3	22.7							16.7	73			6		21.9	53			8	
Lowest		9.0	14.6							10.3	63		ENE	4		13.2	29		E	6	
Highest		14.3	28.5	9.4			SE	35		21.5	90		#	9		27.9	84		SW	13	
Total				9.8																	

Appendix C – Aboriginal Due Diligence Assessment

GLEN DAVIS ROAD, BRIDGE REPLACEMENTS, GLEN DAVIS & CAPEERTEE, NSW

ABORIGINAL DUE DILIGENCE ASSESSMENT

Report to The Environmental Factor
on behalf of Lithgow City Council

December 2021





EXECUTIVE SUMMARY

Apex Archaeology were engaged to assist The Environmental Factor (TEF) on behalf of Lithgow City Council (LCC) in the Aboriginal due diligence assessment of the proposed upgrade of three wooden bridges along Glen Davis Road, between Capertee and Glen Davis, NSW.

This report has been produced in accordance with the DECCW 2010 *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (the Due Diligence Code of Practice), in order to assess the Aboriginal archaeological values of the study area.

The study areas are located along Glen Davis Road, approximately 127km north west of Sydney, NSW. It is located within the Lithgow City Council (LCC) Local Government Area (LGA).

A site visit was conducted on 22 September 2021. No previously recorded archaeological sites are located within the immediate study areas of Coco Creek Bridge and Crown Creek Bridge. However, three registered sites were identified within 500m of Airly Creek Bridge. No newly identified archaeological material was identified during the survey. Ground surface visibility (GSV) was low throughout the three study areas. GSV was rated at 20% overall.

Ground disturbance was high throughout each study area. Evidence of disturbance relating to road construction works, benching into hillsides and imported fill has impacted the current study areas along the road verge leading up to the bridges and the creek banks either side of each bridge due to the original bridge construction.

The following recommendations have been made:

- No further Aboriginal archaeological assessment is required prior to the commencement of upgrade works as described in this report.
- The results of this assessment fulfil the requirement for Due Diligence in accordance with the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (Code of Practice). Works may proceed with caution.
- The proposed works must be contained to the area assessed during this due diligence assessment, as shown on Figure 1. If the proposed location is amended, further archaeological assessment may be necessary to determine if the proposed works will impact any Aboriginal objects or archaeological deposits.
- Should unanticipated archaeological material be encountered during site works, all work must cease and an archaeologist contacted to make an assessment of the find. Further archaeological assessment and Aboriginal community consultation may be required prior to the recommencement of works. Any objects confirmed to be Aboriginal in origin must be reported to Heritage NSW.



Apex Archaeology would like to acknowledge the Aboriginal people who are the traditional custodians of the land in which this project is located. Apex Archaeology would also like to pay respect to Elders both past and present.

DOCUMENT CONTROL

The following register documents the development and issue of the document entitled 'Glen Davis Road, Bridge Replacements, Glen Davis and Capertee, NSW – Aboriginal Due Diligence Assessment', prepared by Apex Archaeology in accordance with its quality management system.

Revision	Prepared by	Reviewed by	Comment	Issue Date
1 – Draft	Leigh Bate	Jenni Bate	Issue for client review	4 October 2021
2 – Final	Leigh Bate	TEF	Final issued to client	10 December 2021



GLOSSARY OF TERMS

Aboriginal Object	An object relating to the Aboriginal habitation of NSW (as defined in the NPW Act), which may comprise a deposit, object or material evidence, including Aboriginal human remains.
AHIMS	Aboriginal Heritage Information Management System maintained by Heritage NSW, detailing known and registered Aboriginal archaeological sites within NSW
AHIP	Aboriginal Heritage Impact Permit
BP	Before Present, defined as before 1 January 1950.
Code of Practice	The DECCW September 2010 <i>Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales</i>
Consultation	Aboriginal community consultation in accordance with the DECCW April 2010 <i>Aboriginal cultural heritage consultation requirements for proponents 2010</i> . Consultation is not a required step in a due diligence assessment; however, it is strongly encouraged to consult with the relevant Local Aboriginal Land Council and to determine if there are any Aboriginal owners, registered native title claimants or holders, or any registered Indigenous Land Use Agreements in place for the subject land
DA	Development Application
DECCW	The Department of Environment, Climate Change and Water – now Heritage NSW
Disturbed Land	If land has been subject to previous human activity which has changed the land's surface and are clear and observable, then that land is considered to be disturbed
Due Diligence	Taking reasonable and practical steps to determine the potential for an activity to harm Aboriginal objects under the <i>National Parks and Wildlife Act 1974</i> and whether an application for an AHIP is required prior to commencement of any site works, and determining the steps to be taken to avoid harm
Due Diligence Code of Practice	The DECCW Sept 2010 <i>Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales</i>
DPIE	Department of Planning, Industry and Environment (formerly OEH)
GIS	Geographical Information Systems
GSV	Ground Surface Visibility
Harm	To destroy, deface or damage an Aboriginal object; to move an object from land on which it is situated, or to cause or permit an object to be harmed
Heritage NSW	Heritage NSW in the Department of Premier and Cabinet, responsible for heritage matters within NSW
LALC	Local Aboriginal Land Council
LGA	Local Government Area
LCC	Lithgow City Council
NPW Act	NSW <i>National Parks and Wildlife Act 1974</i>
OEH	The Office of Environment and Heritage of the NSW Department of Premier and Cabinet – now Heritage NSW
RAPs	Registered Aboriginal Parties



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1.0 INTRODUCTION

Apex Archaeology were engaged to assist The Environmental Factor (TEF) on behalf of Lithgow City Council (LCC) in the Aboriginal due diligence assessment of the proposed upgrade of three wooden bridges along Glen Davis Road, between, NSW.

This report has been produced in accordance with the DECCW 2010 *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (the Due Diligence Code of Practice), in order to assess the Aboriginal archaeological values of the study area.

1.1 STUDY AREA

The study areas are located along Glen Davis Road, approximately 127km north west of Sydney, between the townships of Capertee and Glen Davis, NSW. It is located within the Lithgow City Council (LCC) Local Government Area (LGA). Three bridges were assessed, being Airly Creek Bridge, Coco Creek Bridge and Crown Creek Bridge.

1.2 INVESTIGATORS AND CONTRIBUTORS

This report has been prepared by Leigh Bate, Director and Archaeologist with Apex Archaeology, and reviewed by Jenni Bate, Director and Archaeologist with Apex Archaeology. Both have over 14 years of consulting experience within NSW.

Name	Role	Qualifications
Leigh Bate	Project Manager, Primary Report Author, GIS, Field inspection	B.Archaeology; Grad. Dip. Arch; Dip. GIS
Jenni Bate	Review	B.Archaeology; Grad. Dip. CHM

1.3 STATUTORY CONTEXT

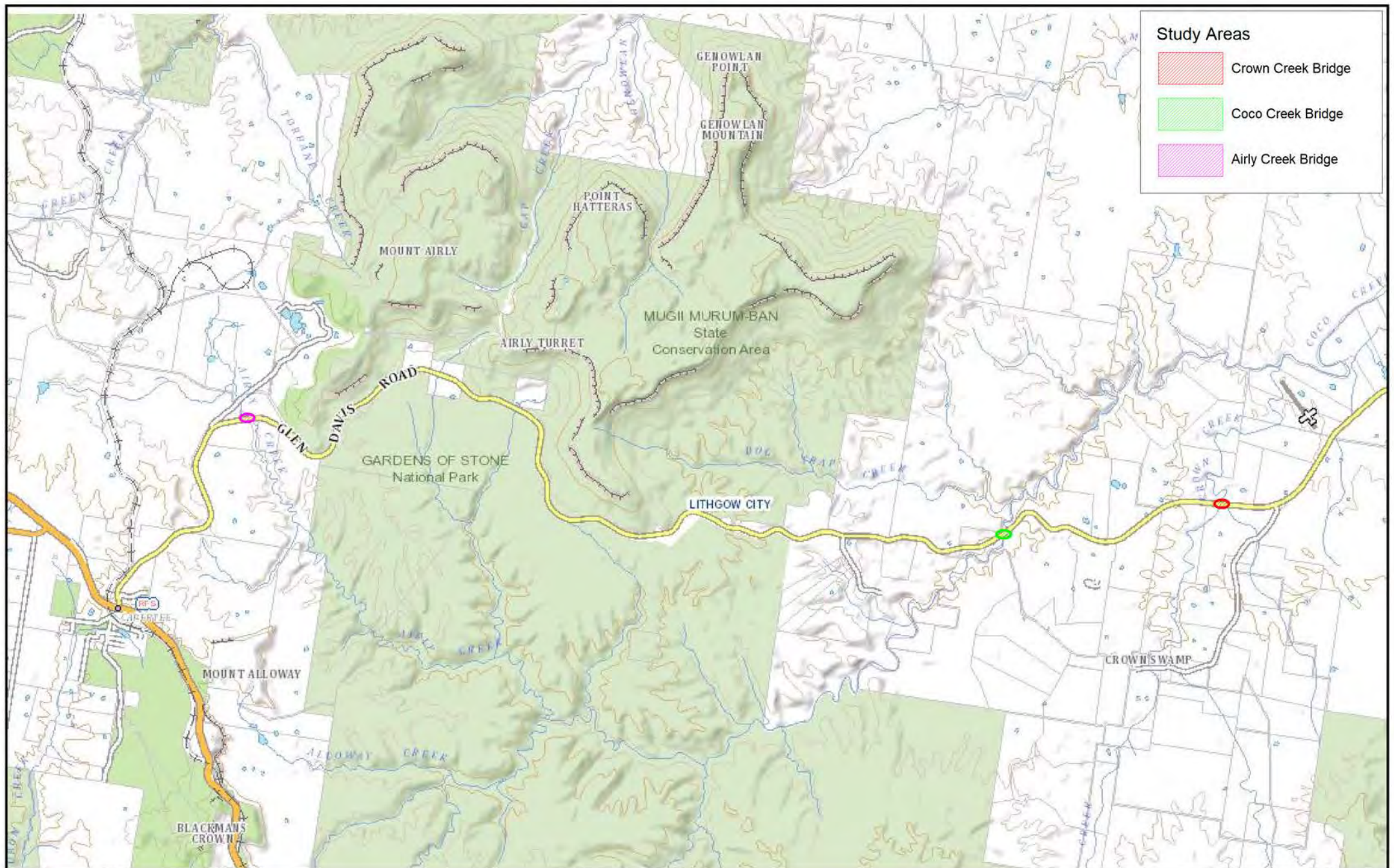
Heritage in Australia, including both Aboriginal and non-Aboriginal heritage, is protected and managed under several different Acts. The following section presents a summary of relevant Acts which provide protection to cultural heritage within NSW.

1.3.1 COMMONWEALTH NATIVE TITLE ACT 1993

The *Native Title Act 1993*, as amended, provides protection and recognition for native title. Native title recognises the traditional rights of Aboriginal and Torres Strait Islanders to land and waters.

The National Native Title Tribunal (NNTT) was established to mediate native title claims made under this Act. Three registers are maintained by the NNTT, as follows:

- National Native Title Register
- Register of Native Title Claims
- Register of Indigenous Land Use Agreements.



A search of the registers identified a current claim by the Warrabinga-Wiradjuri. The claim is currently active and has been accepted for registration; however, at this point in time the claim has not been determined.



Figure 2: Warrabinga-Wiradjuri #7, Tribunal No NC2018/002 Native Title Claim boundary

For the purposes of this due diligence assessment, consultation with the Aboriginal community is not required.

1.3.2 NSW NATIONAL PARKS AND WILDLIFE ACT 1974

Protection for Aboriginal heritage in NSW is provided primarily under the *National Parks and Wildlife Act 1974* (NPW Act). Although cultural heritage is protected by other Acts, the NPW Act is the relevant Act for undertaking due diligence assessments. Protection for Aboriginal sites, places and objects is overseen by Heritage NSW, of the Department of Premier and Cabinet.

Changes to the NPW Act with the adoption of the *NPW Amendment (Aboriginal Objects and Places) Regulation 2010* in October 2010 led to the introduction of new offences regarding causing harm to Aboriginal objects or declared Aboriginal places. These new offences include destruction, defacement or movement of an Aboriginal object or place. Other changes to the NPW Act include:



- Increased penalties for offences relating to Aboriginal heritage for individuals and companies who do not comply with the legislation;
- Introduction of the strict liability offences, meaning companies or individuals cannot claim 'no knowledge' if harm is caused to Aboriginal objects or places; and
- Changes to the permitting process for AHIPs – preliminary archaeological excavations can be undertaken without the need for an AHIP, providing the excavations follow the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales*.

A strict liability offence was introduced, meaning a person who destroys, defaces or moves an Aboriginal object without an Aboriginal Heritage Impact Permit (AHIP) is guilty of an offence, whether they knew it was an Aboriginal object or not. Exercising due diligence (as described in Section 1.4) provides a defence against the strict liability offence.

1.4 NSW DUE DILIGENCE CODE OF PRACTICE

The *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (Code of Practice) was introduced in September 2010. It outlines a method to undertake 'reasonable and practical' steps to determine whether a proposed activity has the potential to harm Aboriginal objects within the subject area, and thereby determine whether an application for an Aboriginal Heritage Impact Permit (AHIP) is required. When due diligence has been correctly exercised, it provides a defence against prosecution under the NPW Act under the strict liability clause if Aboriginal objects are unknowingly harmed without an AHIP.

The Code of Practice provides the 'reasonable and practicable' steps to be followed when determining the potential impact of a proposed activity on Aboriginal objects. Due diligence has been defined by OEH as "taking reasonable and practical steps to determine whether a person's actions will harm an Aboriginal object and, if so, what measures can be taken to avoid that harm" (DECCW 2010:18).

These steps include:

- Identification of whether Aboriginal objects are, or are likely to be, present within the subject area, through completing a search of the Aboriginal Heritage Information Management System (AHIMS);
- Determine whether the proposed activity is likely to cause harm to any Aboriginal objects; and
- Determine the requirement for an AHIP.

Should the conclusion of a due diligence assessment be that an AHIP is required, further assessment must be undertaken, with reference to the following guidelines:

- DECCW, April 2010, *Aboriginal cultural heritage consultation requirements for proponents 2010. Part 6 National Parks and Wildlife Act 1974*;



- DECCW, Sept 2010, *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales*;
- OEH, April 2011, *Guide to Investigation, assessing and reporting on Aboriginal cultural heritage in NSW*; and
- OEH, May 2011, *Applying for an Aboriginal Heritage Impact Permit: Guide for Applicants*.



2.0 THE DUE DILIGENCE CODE OF PRACTICE PROCESS

The Due Diligence Code of Practice provides a specific framework to guide the assessment of Aboriginal cultural heritage. The following section presents the results of this process.

2.1 STEP 1: WILL THE ACTIVITY DISTURB THE GROUND SURFACE?

The proposed works will disturb the ground surface. It is proposed to upgrade and replace three wooden bridges located along Glen Davis.

Earthworks would include excavation, clearing, grubbing, stripping and moving topsoil along the side of the road in windrows within the road easement, excavation of soil, and backfilling, as well installation of new piers and concrete as a part of the bridge upgrade process. All proposed works would have an impact to some extent on the ground surface.

2.2 STEP 2A: AHIMS AND AVAILABLE LITERATURE SEARCH

Heritage NSW is required to maintain a register of Aboriginal sites recorded during archaeological assessments and other activities within NSW. This is known as the Aboriginal Heritage Information Management System (AHIMS). This register provides information about site types, their geographical location, and their current status. It is the requirement for the recorder of a newly identified site to register this site with Heritage NSW to be placed onto the AHIMS register. It is a requirement of the Code of Practice to undertake a search of this register as part of undertaking a due diligence assessment.

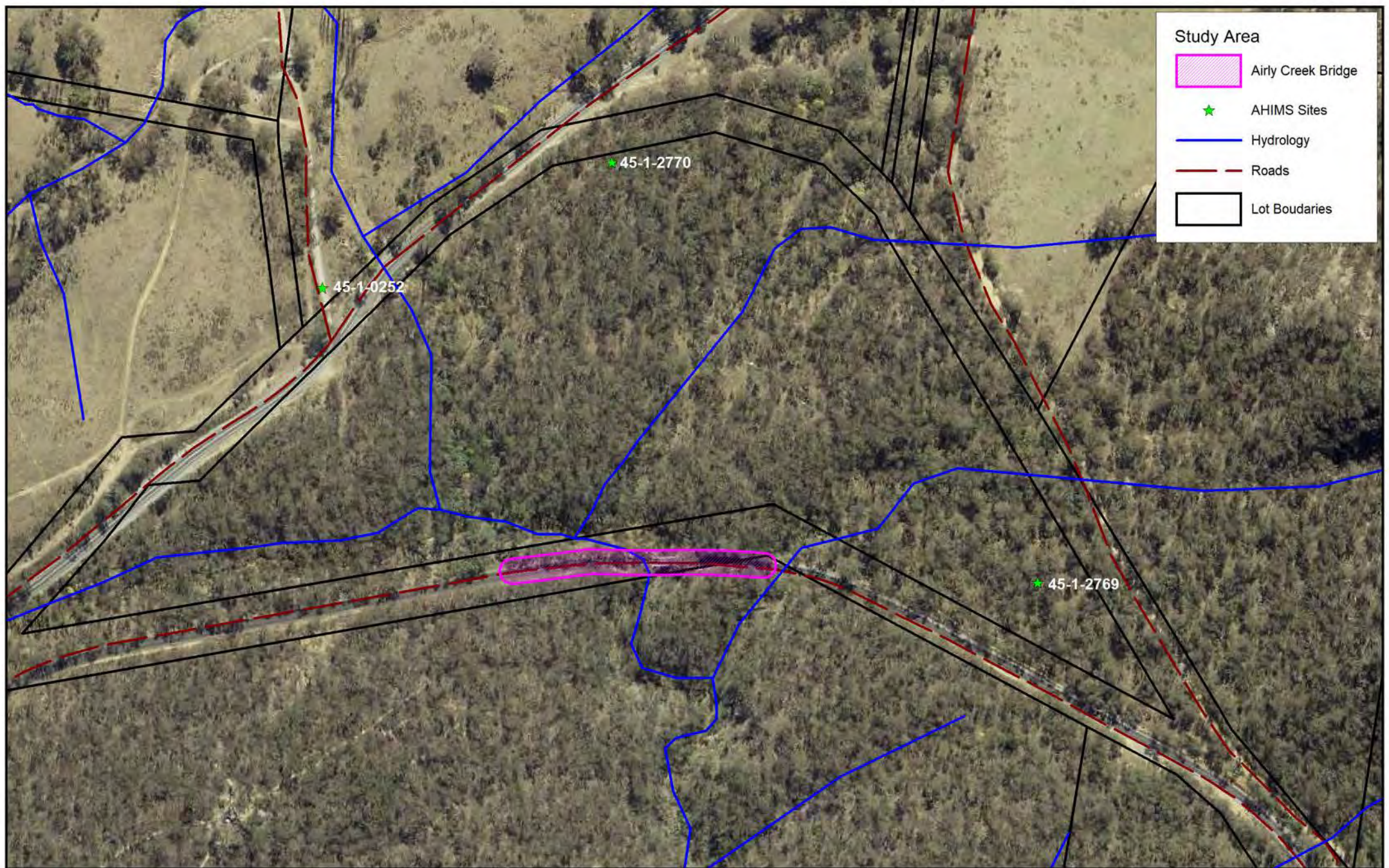
Heritage NSW also maintains a register of archaeological reports relating to archaeological investigations throughout NSW. These reports are a valuable source of information regarding investigations previously completed and their findings, and can inform the assessment process regarding the potential for Aboriginal cultural material and archaeological potential within a study area.

2.2.1 AHIMS RESULTS

A basic search of each bridge location was conducted. No Aboriginal sites were identified within the immediate area around Coco Creek Bridge and Crown Creek Bridge; however, three registered sites were identified using Lot 7001 DP1029380 with a 50m buffer of the Airly Creek bridge site. None of these sites are within the proposed works area. A copy of the basic searches and extensive search are attached in Appendix A.

Table 1: Sites identified during AHIMS search

Site ID	Site Name	Context	Recorders
45-1-0252	AC-OC-1; Airly	Open site	Mrs Robynne Mills
58-1-0720	RPS-AY-010	Open site	Miss Phillipa Sokol
58-1-0720	RPS-AY-011	Open site	Miss Phillipa Sokol



Study Area

- Airly Creek Bridge
- AHIMS Sites
- Hydrology
- Roads
- Lot Boudaries



2.2.2 LITERATURE REVIEW

A review of previous archaeological work within the surrounding region of the study area was undertaken. A number of reports were identified from background research and the AHIMS database and are detailed below.

Table 2: Previous heritage assessments undertaken by archaeological consultants in the region

Consultant	Date	Sites Identified	Region
Wright	1980	No sites identified	Mt Piper Power Station
Haglund	1982	Nine sites identified	Portland Road to Thompsons Creek
Rich	1985	Three sites identified	Mount Piper to Angus Place Colliery
McIntyre	1988	Two sites identified	Thompsons Creek Dam
Brayshaw	1990	No sites Identified	Airly Coal Mine EIS
Brayshaw	1991	Two sites identified	Airly Coal Mine EIS (Modification)
Brayshaw & Dallas	1993	Twenty-Six sites identified	500 kV Transmission line Mount Piper to Marulan
Mills	1998	Two Sites identified	Airly Coal Mine Access Road realignment
OzArk	2005	Eight sites identified	Lambers Gully
Navin Officer	2007	Eight sites identified	Pipers Flat
RPS	2009	No sites identified	Lidsdale, Ivanhoe Coal
OzArk	2009	Management recommendations of two previously recorded sites along with desktop heritage sensitivity mapping.	Baal Bone Colliery
RPS	2010	No sites identified	Centennial Coal Airly (Borehole ARP04)
AECOM	2011	Fifteen Sites identified	Coalpac Consolidation Project (Invincible mine)
RPS	2012	Six sites identified	Lidsdale, Ivanhoe Coal
Umwelt	2016	Two sites identified	Invincible southern extension project

2.2.1 SYNTHESIS

Archaeological works within the wider areas have generally been related to mining and infrastructure related proposals. It appears that artefact evidence generally comprises low density background scatter or discard distributed widely across the locality, with higher densities occurring occasionally in areas of more focused occupation such as camp sites or repeat occupation sites. This generally occurs in favourable environmental contexts such as elevated, well drained spur and ridge crests, flats, terraces and simple slopes in close proximity to watercourses, with a



greater focus on higher order water courses. Artefacts tend to comprise raw materials such as quartz, tuff, silcrete and chert. In general, non-specific flaking activities are represented, although microlith and microblade production is also noted.

Rock shelter sites in the area are identified as varying in size and habitable area, their topographical location and also contents; with rock art occurring relatively infrequently in the locality and generally comprising red ochre hand stencils. Grinding groove sites are not only identified along watercourses on sedimentary bedrock such as sandstone, but also on open sandstone surfaces in other contexts such as in rock shelters. Scarred or culturally modified trees have been identified within the wider region, generally in areas of uncleared old growth vegetation. Low numbers of other sites such as stone arrangements, a possible burial, and ochre or lithic quarries have also been identified.

2.3 STEP 2B: LANDSCAPE FEATURES

An assessment of landscape features is required to determine whether Aboriginal objects are likely to be present within the proposed activity area. Certain landscape features are more likely to have been utilised by Aboriginal people in the past and therefore are more likely to have retained archaeological evidence of this use. Focal areas of activity for Aboriginal people include rock shelters, sand dunes, water courses, waterholes and wetlands, as well as ridge lines for travel routes.

The presence of specific raw materials for artefact manufacture, as well as soil fertility levels to support vegetation resources, are also factors to be considered in the assessment of the environmental context of a study area. Geomorphological factors, such as erosion and accretion of soils, affect the preservation of potential archaeological deposits and therefore need to be considered when making an assessment of the potential for archaeological material to be present within a study area. This assessment is predominantly a desktop exercise.

2.3.1 EXISTING ENVIRONMENT

SOILS, GEOLOGY AND VEGETATION

All three bridge replacement areas fall within the Coco soil landscape. The Coco soil landscape is a colluvial landscape situated on narrow crests and ridges and steep sideslopes on mixed Devonian sediments. Local relief is generally 80–180m, with slopes mostly greater than 25%. Rock outcrop and surface boulders, cobbles and gravels are common, especially on quartzite and porphyry parent materials. Soils are highly variable, mostly shallow to moderately deep (30 – 100 cm) stony Lithosols, Earthy Sands, and Yellow Podzolic Soils on porphyries and some quartzites. The underlying geology consists of lower to Middle Devonian rocks. The various formations and their associated rock types are the Kandoo Formation which consists of quartzite, sandstone, schist and tuff.

Vegetation within the area consists of largely uncleared open-woodland communities made up of white box (*Eucalyptus albens*), yellow box (*Eucalyptus*

meliiodora), narrow-leaved ironbark (*Eucalyptus creba*), black cypress pine (*Callitris endlicheri*) and kurrajong (*Brachychiton populneus*). Understorey species include kangaroo grass (*Themeda australis*), blackthorn (*Bursaria spinosa*), native indigo (*Indigofera australis*), spear and wire grasses, (*Stipa spp.*, *Aristida spp.*), tussock grass (*Poa spp.*), grass tree (*Xanthorrhoea spp.*) and wattle (*Acacia spp.*)

HYDROLOGY

The nature of the project is such that the nearest water course is located within each works area. However, for further detail; Airly and Coco Creek connect approximately 7.6km south east of the Airly Creek Bridge and Crown Creek connects to Coco Creek approximately 2km north east of the Crown Creek Bridge. Coco Creek connects to the Capertee River 6.5km north east of the Crown Creek Bridge. Airly and Crown Creek are both second order streams, with Coco Creek a third order stream and the Capertee River a fourth order water course as defined by Strahler system as used by DPI Water (Figure 4). The Capertee River is a perennial stream that is part of the Hawkesbury-Nepean catchment and as such would be the closest source of permanent water for the area. Watercourse classification ranges from first order through to fourth order (and above) with first order being the lowest, ie a minor creek or ephemeral watercourse.

The study area is located within 200m of a natural watercourse. The study area is considered to have high levels of disturbance relating to road and bridge construction. However, as it is in close proximity to a watercourse, there is a requirement to proceed to Step 3 of the due diligence assessment process, as this landscape feature is associated with Aboriginal archaeological potential.

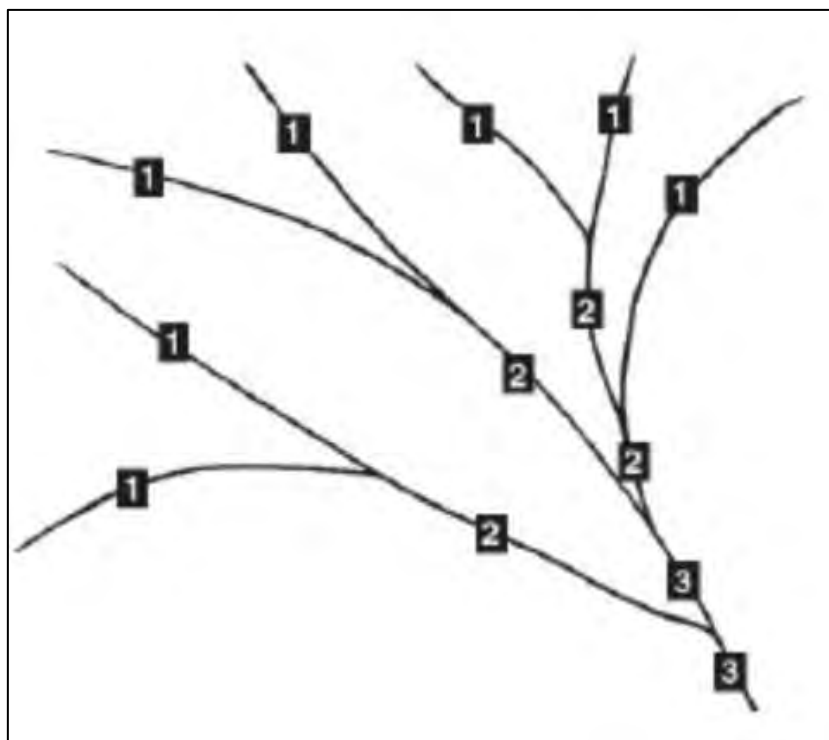


Figure 4: The Strahler system (Source: Department of Planning and Environment 2016).



2.3.2 ETHNOHISTORY

According to Tindale (1974), the study area is located within the eastern border of the Wiradjuri tribal and linguistic territory. This territory is described by Tindale (1974) as being:

...on the Lachlan River and south from Condoblin to Booligal; at Carrathool, Wagga Wagga, Cootamundra, Cowra, Parkes, Trundle; east to Gundagai, Boorowa and Rylstone; at Wellington, Mudgee, Bathurst and Carcoar; west along Billabong Creek to beyond Mosgiel, south west to near Hay and Narranderra, south to Howlong on the upper Murray; at Albury and east to about Tumbarumba (Tindale 1974).

Aboriginal society was constructed of a hierarchy of social levels and groups, with fluid boundaries (Peterson 1976), with the smallest group comprising a family of a man and his wife/wives, children and some grandparents. The next level consists of bands, which were small groups of several families who worked together for hunting and gathering purposes. The third level comprised regional networks with a number of bands, and these bands generally shared a common language dialect and/or had a belief in a common ancestor. Networks would come together for specific ceremonial purposes. The highest level is the tribe, which is usually described as a linguistic unit with flexible territorial boundaries (Peterson 1976). Various dialects of the Wiradjuri language were identified within the region (Tindale 1974). Tindale also considered the Wiradjuri to be “one of the largest tribal groupings in Australia, with many hordes”.

The Mudgee/Rylstone area was considered to form the central focus for a clan territory (Pearson 1981). Following the contact period in the 1820s, when European people began settling in the Hunter Valley, clashes between Aboriginal and European settlers were common (Dormer 1997). R.H Mathews (1894) described a ceremonial bora ground located along Wilpinjong Creek, which he saw in 1893 along with a local resident, who described that he had been aware of several boras being held there since the 1860s.

An Aboriginal mission station was established at Wellington by 1832. An 1845 report by Graham D. Hunter, Commissioner for Crown Lands in the County of Bligh, described that the condition of the Aboriginal peoples in the area had not changed much in recent years, with some employed with the caveat that they could still participate in traditional life when required by tribal elders. Conflict was still occurring in some areas but the Commissioner was trying to provide protection for both ‘white and black’ people (Dormer 1997:151).

A major influenza epidemic in 1860 decimated the local Aboriginal population (Murray-Prior 1973, quoted in NOHC 2005: F-38). The discovery of gold at Red Hill in 1870 led to a substantial increase in the non-Aboriginal population within the area and by 1872 Gulgong had reached 20,000 inhabitants.



Aboriginal people utilised a wide range of subsistence resources in the past, with ethnohistorical sources recording the diet of Aboriginal people including kangaroo, possum, kangaroo rat, lizards, birds, platypus, wallaby and a range of plants and insects as well as fish and shell fish (Pearson 1981). A wide range of native animals, including birds and reptiles, have been identified within the wider environment, and are likely to have been utilised as food resources by Aboriginal people in the past.

2.3.3 RAW MATERIALS

A wide range of raw materials were selected by Aboriginal people for flaking to create stone implements. Material types ranged from high quality to poor quality for flaking purposes, depending on the geology of the area and readily available material types. The following is a description of a range of raw material types known to have been utilised by Aboriginal people for the creation of stone artefacts.

BRECCIA

Breccias are coarse, angular volcanic fragments cemented together by a finer grained tuffaceous matrix.

CHALCEDONY

Chalcedony is a microcrystalline, siliceous rock which is very smooth and can be glossy. Introduction of impurities can produce different coloured versions of chalcedony, including yellow/brown (referred to as carnelian), brown (sard), jasper (red/burgundy) and multicoloured agate. It flakes with a sharp edge and was a prized material type for the creation of stone artefacts in parts of Australia (Kuskie & Kamminga 2000: 186).

CHERT

Chert is a highly siliceous sedimentary rock, formed in marine sediments and also found within nodules of limestone. Accumulation of substances such as iron oxide during the formation process often results in banded materials with strong colours. Chert is found in the Illawarra Coal Measures and also as pebbles and colluvial gravels. It flakes with durable, sharp edges and can range in colour from cream to red to brown and grey.

PETRIFIED WOOD

Petrified wood is formed following burial of dead wood by sediment and the original wood being replaced by silica. Petrified wood is a type of chert and is a brown and grey banded rock and fractures irregularly along the original grain.

QUARTZ

Pure quartz is formed of silicon dioxide, and has a glossy texture and is translucent. Introduction of traces of minerals can lead to colouration of the quartz, such as pink, grey or yellow. The crystalline nature of quartz allows for minute vacuoles to fill with gas or liquid, giving the material a milky appearance.



Often quartz exhibits internal flaws which can affect the flaking quality of the material, meaning that in general it is a low-quality flaking material (Kuskie & Kamminga 2000: 186). However, quartz is an abundant and widely available material type and therefore is one of the most common raw materials used for artefact manufacture in Australia. Flaking of quartz can produce small, very sharp flakes which can be used for activities such as cutting plant materials, butchering and skinning.

QUARTZITE

Formed from sandstone, quartzite is a metamorphic stone high in silica that has been heated or had silica infiltrate the voids found between the sand grains. Quartzite ranges in colour from grey to yellow and brown.

SILCRETE

Silcrete is a siliceous material formed by the cementing of quartz clasts with a matrix. These clasts may be very fine grained to quite large. It ranges in colour from grey to white, brown, red or yellow. Alluvial and terrace gravels of the Hunter River were a major primary source of silcrete within the Hunter Valley. Silcrete flakes with sharp edges and is quite durable, making silcrete suitable for use in heavy duty woodworking activities and also for spear barbs (Kuskie & Kamminga 2000:184).

TUFF/INDURATED MUDSTONE

There is some disagreement relating to the identification of lithic materials as tuff or indurated mudstone. The material is a finely textured, very hard yellow/orange/reddish-brown or grey rock from the upper Hunter Valley. Kuskie and Kamminga (2000: 6, 180) describe that identification of lithic materials within the Hunter Valley followed the classification developed by Hughes (1984), with indurated mudstone described as a common stone material in the area. However, Kuskie and Kamminga's analysis, which included x-ray diffraction, identified that lithics identified as 'indurated mudstone' was actually rhyolitic tuff, with significant differences in mineral composition and fracture mechanics between the stone types. They define mudstone as rocks formed from more than 50% clay and silt with very fine grain sizes and then hardened.

The lithification of these mudstones results in shale (Kuskie & Kamminga 2000: 181) and thus 'indurated mudstone', in the opinion of Kuskie and Kamminga, do not produce stones with the properties required for lithic manufacture.

In 2011, Hughes, Hiscock and Watchman undertook an assessment of the different types of stones within the Hunter Valley to determine whether tuff or indurated mudstone is the most appropriate terminology for describing this lithic material. The authors undertook thin section studies of a number of rocks from the Hunter Valley and determined that the term 'indurated mudstone' is appropriate, with an acknowledgment that some of this material may have been volcanic in origin. They also acknowledge that precise interpretation of the differences between material types is difficult without detailed petrological examination, and suggest that



artefacts produced on this material are labelled as 'IMT' or 'indurated mudstone/tuff'.

2.3.4 PROCUREMENT

Assemblage characteristics are related to and dependent on the distance of the knapping site from raw materials for artefact manufacture, and different material types were better suited for certain tasks than other material types. Considerations such as social or territorial limitations or restrictions on access to raw material sources, movement of groups across the landscape and knowledge of source locations can influence the procurement behaviour of Aboriginal people. Raw materials may also have been used for trade or special exchange between different tribes.

2.3.5 MANUFACTURE

A range of methodologies were used in the manufacture of stone artefacts and tools, through the reduction of a stone source. Stone may have been sourced from river gravels, rock outcrops, or opportunistic cobble selection. Hiscock (1988:36-40) suggests artefact manufacture comprises six stages, as follows:

1. The initial reduction of a selected stone material may have occurred at the initial source location, or once the stone had been transported to the site.
2. The initial reduction phase produced large flakes which were relatively thick and contained high percentages of cortex. Generally the blows were struck by direct percussion and would often take advantage of prominent natural ridges in the source material.
3. Some of these initial flakes would be selected for further reduction. Generally only larger flakes with a weight greater than 13-15 grams would be selected for further flaking activities.
4. Beginning of 'tranchet reduction', whereby the ventral surface of a larger flake was struck to remove smaller flakes from the dorsal surface, with this retouch applied to the lateral margins to create potential platforms, and to the distal and proximal ends to create ridges and remove any unwanted mass. These steps were alternated during further reduction of the flake.
5. Flakes were selected for further working in the form of backing.
6. Suitable flakes such as microblades were retouched along a thick margin opposite the chord to create a backed blade.

Hiscock (1986) proposed that working of stone materials followed a production line style of working, with initial reduction of cores to produce large flakes, followed by heat treatment of suitable flakes before the commencement of tranchet reduction. These steps did not necessarily have to occur at the same physical location, but instead may have been undertaken as the opportunity presented.



2.3.6 PREDICTIVE MODEL

Navin Officer (2005) and South East Archaeology (2009; 2013) have both developed and refined detailed predictive and occupational models for the Aboriginal occupation in the wider region. In general, their occupational models identified that:

- Aboriginal occupation focussed predominantly on resource rich zones, particularly along higher order watercourses. Abundant resources for sustenance and water would supply longer stays for family and community base camps, as well as occasional gatherings of larger groups. These areas were considered to be primary resource zones;
- Secondary resource zones were focussed on watercourses, wetlands and/or swamps in close proximity to higher order watercourses and the associated flats and terraces. These areas were seasonally occupied during the course of hunting and gathering activities by small hunting parties and family groups. Generally level ground was selected for camping, near water sources, and was sporadic rather than continuous occupation;
- Outside of the primary and secondary resource zones, activities included resource gathering and movement across the landscape by small parties, in order to access areas with greater resources;
- Opportunistic reduction of raw materials to create stone artefacts would be quite widespread across the landscape, in order to produce stone tools on an 'as needed' basis;
- Locally available quartz was favoured for knapping activities, along with tuff and chert, depending on their availability;
- Exposed sandstone would be utilised for creating and maintaining ground edge hatchets, creating grinding grooves. This action may have been opportunistic rather than specific, with evidence of long term, repeated use not expected to occur; and
- Aboriginal occupation of the general area is believed to have occurred within the past 5,000 years, although it is possible it may extend as far as 30,000-40,000 years ago (SEA 2013:23).

From these general predictions of how the area was utilised for occupation by Aboriginal people in the past, a predictive model for the location of archaeological sites was developed by Navin Officer (2005) and South East Archaeology (2009; 2013). This has been summarised below:

- Low spurs within 100m of higher order streams are likely to contain sites with relatively higher numbers of artefacts;
- Very low density artefact scatters may occur throughout valley floor contexts;
- Elevated, level ground adjacent to major, permanent streams has the potential for open sites with higher concentrations of artefacts;
- Stone artefact scatters are likely to increase in number and density relative to the site's proximity to water and raw material sources;



- Suitable rockshelters with relatively level floors, adequate shelter and located in basal slope contexts in association with a drainage line may contain occupation deposit and/or pigment rock art;
- Grinding grooves are likely to occur only where suitable sandstone exposures occur in association with a source of water;
- Burials are rare but may occur in deep, fine grained alluvial or Aeolian sediments, or in the form of stone cairns;
- Scarred trees have the potential to survive in areas of suitable old growth trees;
- Archaeological deposits with high scientific significance are most likely to be found in rockshelters with suitable deposit depth, or on elevated areas with aggrading sediments in close proximity to permanent or reliable water sources, or within rockshelter contexts;
- Outside of these identified areas, stratified deposits or in situ archaeological material is unlikely to survive due to bioturbation and/or natural processes such as water action, erosion etc; and
- Isolated surface and subsurface archaeological material may exist as background scatter in very low densities, but the location of this potential material is impossible to predict.

The hydrology, topography, soils and geology of an area are all important considerations when developing a predictive model for an area.

2.4 STEP 3: AVOID HARM

Given the proximity to water, it was necessary to undertake a visual inspection of the study areas to identify any surface objects or landforms with potential archaeological deposits (PAD), and to relocate and evaluate the previously recorded sites wherever possible. This inspection would allow conclusions to be made regarding the probability of archaeological objects occurring within the proposed area of upgrade. This would assist in determining if there was any archaeological potential within the study area which could potentially be harmed by the proposed works, and in turn, assist in determining if harm to the archaeological resource could be avoided.

The proposed works will impact the entirety of the study area, through the bridge upgrade construction works.

2.5 STEP 4: VISUAL INSPECTION

A visual pedestrian inspection of the study area was undertaken on Wednesday 22 September 2021 by Leigh Bate and Jenni Bate, Archaeologists with Apex Archaeology.

2.5.1 SURVEY COVERAGE

The area was inspected by pedestrian survey to identify any surface artefacts or any areas with potential for subsurface deposits to be present. Both sides of a 100m



section of road verge leading up to each bridge and the area around the bridge were inspected as part of the survey.

2.5.2 RESULTS

No newly identified archaeological material was identified during the survey. Ground surface visibility (GSV) was low throughout the study area. GSV was rated at 20% overall.

Ground disturbance was high throughout the study area. Evidence of disturbance relating to road construction works, drainage and road maintenance has impacted the current study area along the road verge. Construction of each of the current bridges has also disturbed the creek banks and lead up approaches quite significantly as the road has been built up considerably to accommodate each bridge along with benching into hillsides.

No areas of potential archaeological deposit (PAD) were identified within the study area. No cultural archaeological material was identified on the ground surface within the study area.



Plate 1: General view looking east from ~100m west of the Airly Creek bridge site along Glen Davis Road.



Plate 2: Looking east across Airly Creek bridge



Plate 3: Looking west across the built up creek bank and wooden piers for Airly Creek bridge.



Plate 4: Looking west from ~100m east of the Airly Creek bridge site along Glen Davis Road.



Plate 5: Looking west across the Coco Creek Bridge site.



Plate 6: Looking at the wooden piers and creek bank of the Coco Creek bridge.



Plate 7: Looking east ~100 west of the Coco Creek Bridge site.



Plate 8: Looking west from ~100m east of Crown Creek Bridge.



Plate 9: Looking west across Crown Creek Bridge.



Plate 10: Looking east from ~100m west of the Crown Creek Bridge site.



Plate 11: Looking east along an access track to the north of Crown Creek Bridge running parallel with Glen Davis Road.



Plate 12: Looking south east showing creek bank disturbance from original bridge construction.



Plate 13: Imported fill and ground disturbance along the eastern approach to Crown Creek Bridge.



2.5.3 DISCUSSION

In accordance with the Due Diligence Code of Practice, land is considered disturbed if human activities within the area have left clear and observable changes on the landscape. The study area meets this definition in general, as ground disturbance was high throughout the study area. Evidence of machine excavation along the road verge, excavated drainage lines and excavation relating to the original road and bridge construction have clearly impacted the entirety of the road corridor and bridge sites within the study area. Further impacts from subsequent road maintenance have caused further disturbance along with erosion in some places. Creek bank modification along both eastern and western approaches for all three bridges has disturbed the ground surface to such a degree that any intact archaeological deposits would have been removed during the original construction had they been present.

The level of disturbance within the study area means that there is a low chance of intact sub-surface deposits being present within the area. The road verge either side of each bridge was also inspected up to approximately 100m from each bridge. This area was also assessed as having no potential for sub-surface deposits due to the level of disturbance relating to previous clearance, road construction activities, and ongoing maintenance activities over the years.

The previously recorded sites within 500m of the Airly Creek study area were all located well outside the proposed works area, and none of the sites would be impacted as part of the proposed works.



3.0 CONCLUSIONS AND RECOMMENDATIONS

3.1 CONCLUSIONS

- No previously recorded Aboriginal sites are located within the works area.
- No archaeological material was identified on the ground surface within the area assessed.
- The study area is assessed as having no potential for subsurface archaeological deposits and this is confirmed by the site inspection.
- This assessment was based on identification of landform elements, previous archaeological work undertaken within the wider Capertee/Glen Davis region, and a visual inspection of the study area.

3.2 RECOMMENDATIONS

- No further Aboriginal archaeological assessment is required prior to the commencement of upgrade works as described in this report.
- The results of this assessment fulfil the requirement for Due Diligence in accordance with the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (Code of Practice). Works may proceed with caution.
- The proposed works must be contained to the area assessed during this due diligence assessment, as shown on Figure 1. If the proposed location is amended, further archaeological assessment may be necessary to determine if the proposed works will impact any Aboriginal objects or archaeological deposits.
- Should unanticipated archaeological material be encountered during site works, all work must cease and an archaeologist contacted to make an assessment of the find. Further archaeological assessment and Aboriginal community consultation may be required prior to the recommencement of works. Any objects confirmed to be Aboriginal in origin must be reported to Heritage NSW.



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APPENDIX A: AHIMS SEARCH RESULTS

Apex Archaeology

PO BOX 236

Nowra New South Wales 2541

Attention: Leigh Bate

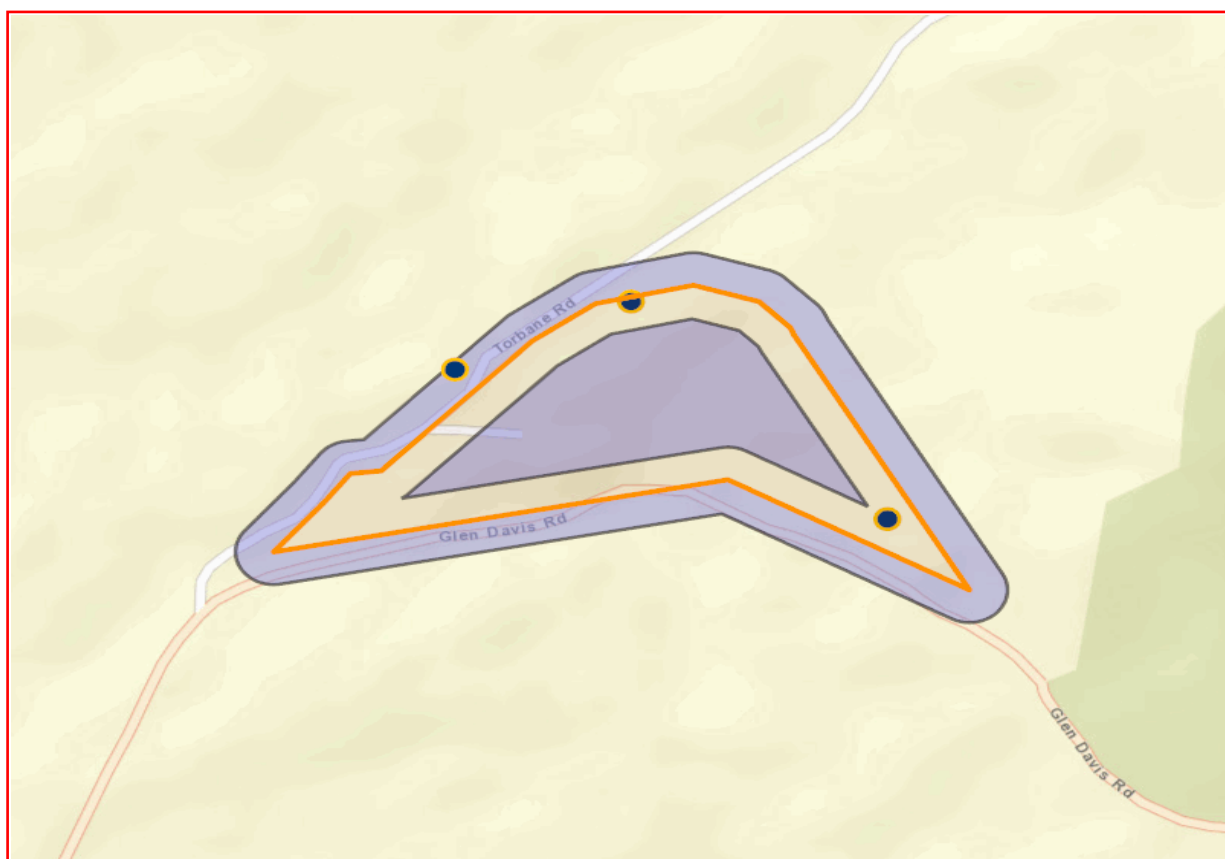
Email: leigh@apexarchaeology.com.au

Date: 22 September 2021

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lot : 7001, DP:DP1029380, Section : - with a Buffer of 50 meters, conducted by Leigh Bate on 22 September 2021.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of Heritage NSW AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

3	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the [NSW Government Gazette \(https://www.legislation.nsw.gov.au/gazette\)](https://www.legislation.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Heritage NSW upon request

Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not to be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Heritage NSW and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date. Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

Apex Archaeology

PO BOX 236

Nowra New South Wales 2541

Attention: Leigh Bate

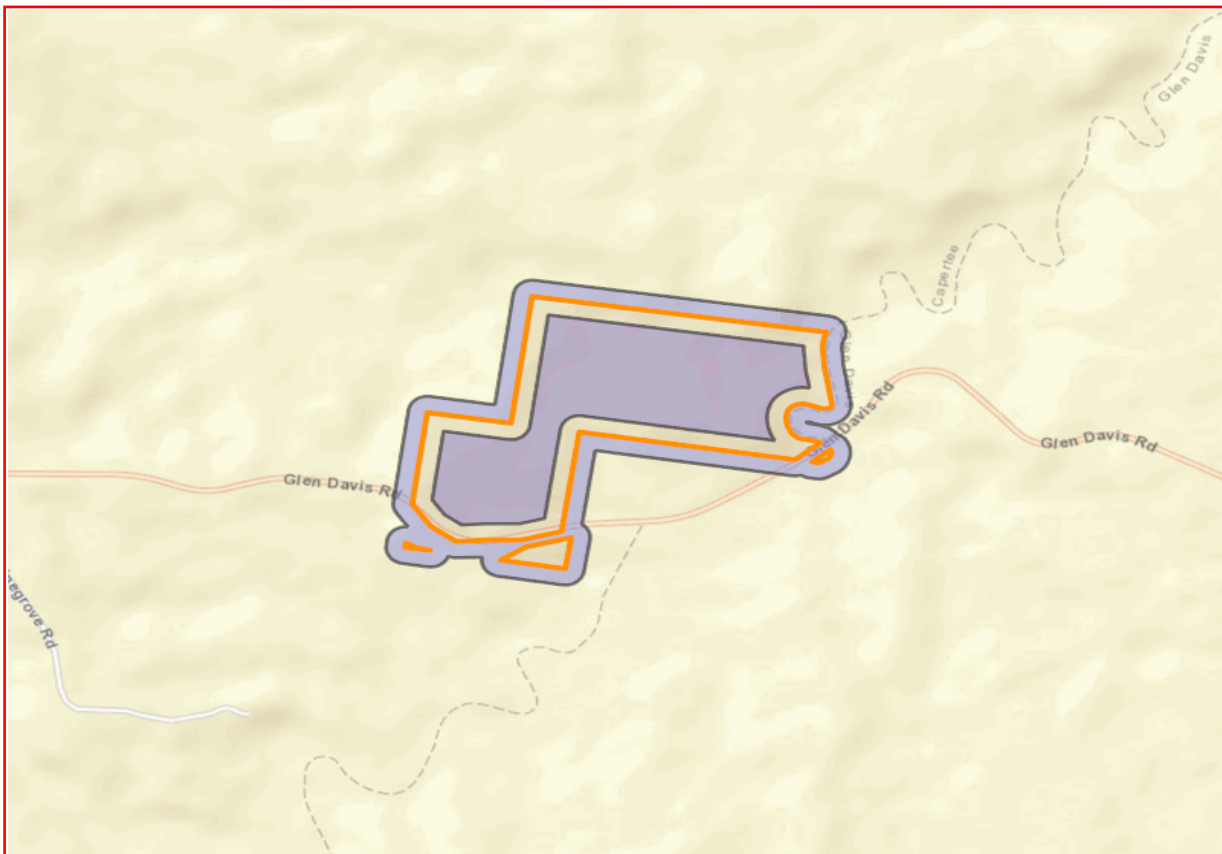
Email: leigh@apexarchaeology.com.au

Date: 22 September 2021

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lot : 100, DP:DP1254926, Section : - with a Buffer of 50 meters, conducted by Leigh Bate on 22 September 2021.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of Heritage NSW AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

0	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the [NSW Government Gazette \(https://www.legislation.nsw.gov.au/gazette\)](https://www.legislation.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Heritage NSW upon request

Important information about your AHIMS search

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- Information recorded on AHIMS may vary in its accuracy and may not be up to date. Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

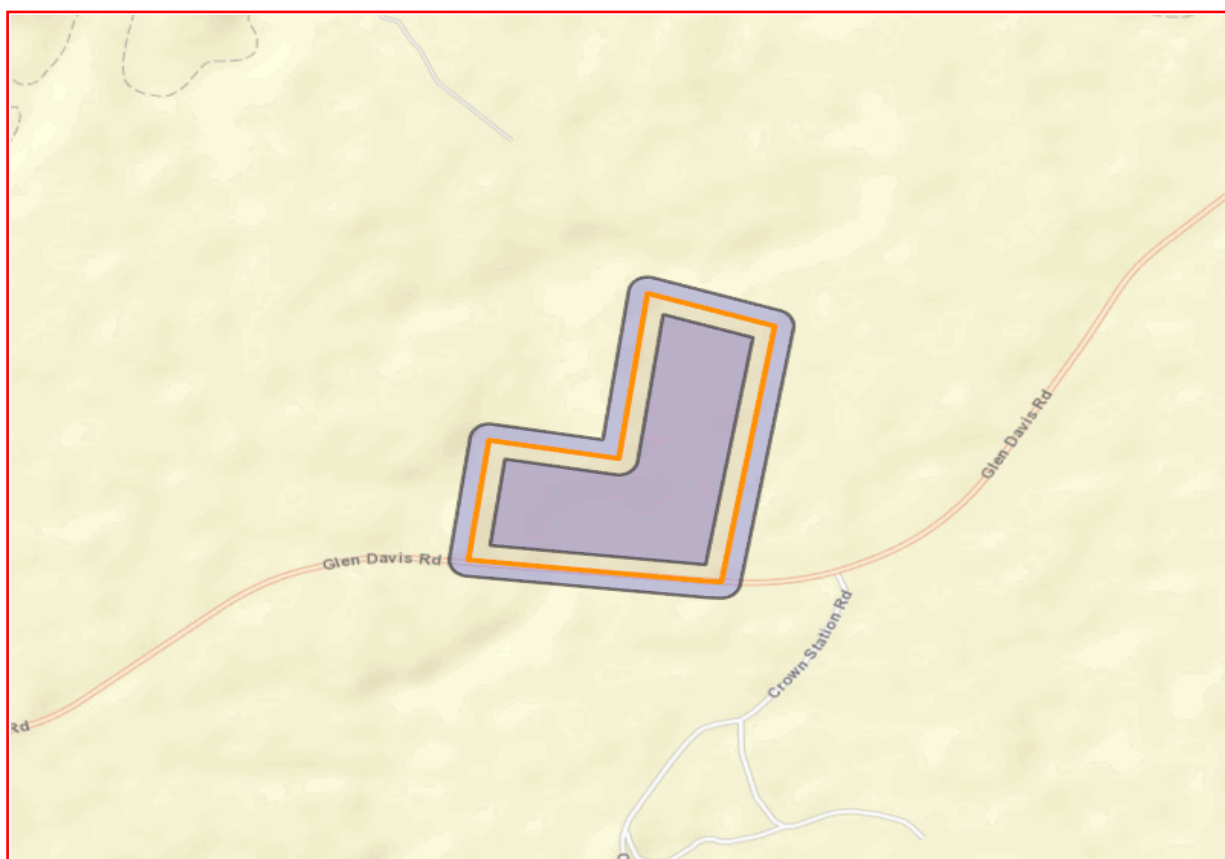
Apex Archaeology
PO BOX 236
Nowra New South Wales 2541
Attention: Leigh Bate
Email: leigh@apexarchaeology.com.au

Date: 22 September 2021

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lot : 5, DP:DP248232, Section : - with a Buffer of 50 meters, conducted by Leigh Bate on 22 September 2021.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of Heritage NSW AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

0	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the [NSW Government Gazette \(https://www.legislation.nsw.gov.au/gazette\)](https://www.legislation.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Heritage NSW upon request

Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not to be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Heritage NSW and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date. Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

<u>SiteID</u>	<u>SiteName</u>	<u>Datum</u>	<u>Zone</u>	<u>Easting</u>	<u>Northing</u>	<u>Context</u>	<u>Site Status **</u>	<u>SiteFeatures</u>	<u>SiteTypes</u>	<u>Reports</u>
45-1-0252	AC-OC-1;"Airly";	AGD	56	220110	6331040	Open site	Valid	Artefact : -	Open Camp Site	
	<u>Contact</u>	<u>Recorders</u>	<u>Permits</u>							
45-1-2769	RPS-AY-010	GDA	56	220789	6331017	Open site	Valid	Artefact : -		
	<u>Contact</u>	<u>Recorders</u>	<u>Permits</u>							
45-1-2770	RPS-AY-011	GDA	56	220443	6331341	Open site	Valid	Artefact : -		
	<u>Contact</u>	<u>Recorders</u>	<u>Permits</u>							

** Site Status

Valid - The site has been recorded and accepted onto the system as valid

Destroyed - The site has been completely impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There is nothing left of the site on the ground but proponents should proceed with caution.

Partially Destroyed - The site has been only partially impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There might be parts or sections of the original site still present on the ground

Not a site - The site has been originally entered and accepted onto AHIMS as a valid site but after further investigations it was decided it is NOT an aboriginal site. Impact of this type of site does not require permit but Heritage NSW should be notified

Report generated by AHIMS Web Service on 02/10/2021 for Leigh Bate for the following area at Lot : 7001, DP:DP1029380, Section : null with a Buffer of 50 meters.. Number of Aboriginal sites and Aboriginal objects found is 3

This information is not guaranteed to be free from error omission. Heritage NSW and its employees disclaim liability for any act done or omission made on the information and consequences of such acts or omission.

Appendix D – Summary of Environmental Safeguards

The following Environmental Safeguards for Soils and Erosion, Waterways, Noise and Vibration, Air Quality, Aboriginal and Non-Aboriginal Heritage, Biodiversity, Traffic and Transport, Socio-economic Considerations, Waste, Visual Amenity and Climate Change are considered part of the Proposal and must be implemented and maintained. Impacts associated with the Proposal will not be significant if the below-mentioned Safeguards are implemented and maintained throughout construction and operational phases of the Proposal.

Environmental Safeguards – Soils and Erosion

Construction

- No vegetation outside the approved direct impact footprint is to be harmed or removed; vegetation that is not approved for clearance is to be protected to ensure soils are not exposed or destabilised unnecessarily.
- All areas where groundcovers/vegetation are required to be removed will require careful management during construction due to the higher erosion risks, including Erosion and sediment (ERSED) control measures are to be implemented and maintained to:
 - Prevent sediment moving off-site and sediment laden water entering the Creeks, any drainage lines, drain inlets, or dams and
 - Reduce water velocity and capture sediment on site.
- ERSED controls are to be installed prior to the commencement of works and checked and maintained on a regular basis (including clearing of sediment from behind barriers).
- ERSED control measures are not to be removed until the works are complete, and areas are stabilised.
- Monitoring and response actions with regards to ERSED controls will need to be incorporated within the Construction Environmental Management Plan (CEMP) for the Proposal when prepared.
- Any disturbed or excavated areas are to be stabilized as soon as possible using the most appropriate combination of the following measures:
 - Hydromulching with appropriate native grass mixture and/or groundcover species,
 - Turfing with appropriate native grass mixture and/or groundcover species,
 - Seeding with appropriate native grass mixture and/or groundcover species; and/or
 - Revegetation using appropriate native tubestock or mature seedlings.
- Sediment fences/strawbale filters or equivalent should be installed wherever water is predicted to enter/exit the works area.
- The maintenance of established stockpile sites during construction is to be in accordance with the Landcom/Department of Housing Managing Urban Stormwater, Soils and Construction Guidelines (the Blue Book) (Landcom 2004).
- Stockpiles are recommended to be formed in accordance with the Blue Book Standard Drawing 4-1, and offsite/away from waterbodies where possible.
- Topsoil and subsoil are to be separated and protected from degradation, erosion or mixing with fill or waste. Materials are to be reused onsite where appropriate for infilling works,

including re-spreading of topsoil as appropriate to enable rapid rehabilitation. Where onsite reuse cannot be accommodated, soil materials should be put to beneficial reuse elsewhere.

- If contaminated soils are encountered during construction, a site assessment is to be completed in accordance with Schedule A 'Recommended general process for assessment of site contamination' (NEPM 1999).
- If contaminated soils are encountered, they will be managed (and if necessary excavated, contained, treated and disposed of) in accordance with the law and relevant EPA and Council guidance.
- All chemical usage and storage during construction is to be in line with legislated requirements, to prevent Pollution of Land, which is prohibited under Section 142 A of the POEO Act.

Operation

- Monitoring of the site is to be undertaken to ensure ERSED controls remain in place until the site is re-stabilised, and to ensure no sediment is washed into the waterways following construction and before revegetation / stabilisation efforts are completed.
- Maintenance of vegetative cover on all exposed surfaces (not to be covered by road base/seal or other bridge infrastructure) to be undertaken to ensure the stability of soils on site into the future.
- Infill planting or additional spreading of appropriate native grass mixture and/or groundcover species to be undertaken until the entire site is stabilized.

Environmental Safeguards – Surface and Groundwater

Construction

- If 'dirty' site water is collected from within the direct impact footprint, it is to be redirected to filtration devices to trap sediments and other pollutants, and dissipate flow velocities, prior to discharging to the surrounding environment. Drainage and runoff should be controlled in such a way that no foreign substrates or materials leave the site.
 - 'Clean' water from outside the study area is to be diverted around the site, to avoid contamination and to prevent scour/erosion of the site (particularly the embankments at each crossing) during rainfall events during construction.
 - Works to be completed in dry times (i.e. times of no current or predicted rainfall).
 - Appropriate sediment and erosion controls are to be installed and maintained during construction, to ensure sediment and pollutant laden surface water runoff does not enter adjacent waterways/drainage lines.
 - Any water intersected or used during the drilling/piling procedure is to be captured in an appropriately lined sump and disposed of appropriately off site.
 - All litter, including cigarette butts and food wrappers, is to be collected in a suitable receptacle and disposed of appropriately throughout the construction phase to ensure these do not end up polluting waters.
 - Re-fuelling of plant and equipment is to occur offsite, or in impervious bunded areas located a minimum of 40 metres from the Creeks, any drains, drainage lines or dams.
-

- Vehicle wash-down and/or cement truck washout (if required) is to occur offsite unless it forms part of sediment control, where it is to occur in a suitably bunded area with controlled run-off.
- Monitoring of water quality is to be undertaken downstream of the construction sites during and immediately following rainfall events, to identify if ERSed controls are functioning as intended. Visual inspections should be undertaken by an appropriately qualified person/s to determine if water is turbid, or if there is evidence of petrochemicals or other pollutants present as a consequence of construction activities.
- Segregate and stockpile topsoil removed from the area a minimum of 40 m from any waterway and on a flat, stable area. Use measures such as silt fences and holding ponds to prevent stockpile runoff from entering waterways.
- Minimize the length of time that soils are exposed by stabilising as soon as practical by seeding, spreading mulch or installing erosion control blanket as appropriate.
- Biosecurity and water health protection measures should be implemented throughout the construction phase, including:
 - Machinery should arrive on site in a clean, washed condition, free of fluid leaks, pests and/or weeds/spores.
 - Regular weed control should be undertaken in disturbed areas throughout the construction period to prevent weed spread into waterways, if notifiable/listed weed material is present.
 - Ensure all pesticide/herbicides used are registered for use within a waterway, as per NSW DPI guidelines. Alternatively, opt to remove weeds mechanically where possible.
- Spill response protocols for plant, equipment and chemicals used or stored on site during construction are to be available and accessible at all times to prevent and minimise potential for Pollution of Waters (s120 POEO Act).
- A Soil and Water Management Plan will be developed as part of the CEMP for the Proposal, detailing:
 - Water quality parameters to be adhered to throughout construction
 - Appropriate monitoring locations and frequency
 - Location and types of ERSed controls
 - Proposed revegetation and stabilisation measures to be undertaken

Operation

- Continue to undertake a water quality and quantity monitoring program in line with Council's requirements until all sites are completely stabilised; monitoring should include details of proposed baseline and downstream water quality following any heavy rainfall.
- Subject site rehabilitation, including removal of weeds and revegetation using appropriate native species, to be undertaken to ensure soil stability and prevention of sediment runoff from the site into the future. Revegetation must be maintained with a survival rate of >80%.

Environmental Safeguards – Noise and Vibration**Construction**

- Noise emissions should be considered and managed in accordance of the Interim Construction Noise Guideline (ICNG) (Department of Energy and Climate Change (DECC) 2009).
- Noise impacts to the local community will be limited to recommended standard working hours as detailed in the Interim Construction Noise Guideline 2009 (ICNG). All activities and project works, including the arrival and departure of vehicles delivering or removing materials to or from the site, shall be carried out between the hours of:

7:00am to 6:00pm Monday to Friday,
8:00am to 1:00pm Saturdays, and
No work Sunday and Public Holidays
- Residents that have the potential to be impacted by noise and vibration generated as part of works should be notified of the proposed construction no less than two (2) weeks prior to works commencing.
- Communication of intentions and timeframes to neighbouring properties will minimise misconceptions, uncertainty and negative reactions to noise. The site supervisor should supply a contact number to aid in community liaison.
- All noise and vibration complaints are to be handled in a timely manner.
- The appointed contractor will incorporate Noise and Vibration Management strategies in the CEMP, and suitably induct all staff operating machinery on the site to ensure the standard working hours are adhered to, and that machinery movement (revving, reverse beepers) is kept to a minimum. This management plan must include the general noise and vibration management practices (AS 2436-2010).
- Plant deliveries and site access will occur quietly and efficiently, with parking allowed only within designated areas located away from nearby sensitive receivers.
- Simultaneous operation of high-level noise generating machinery should be avoided by operating at contrasting times or increasing the distance between the plant and the nearest identified receiver.
- High noise generating activities, such as jack hammering, should be carried out in continuous blocks, not exceeding three (3) hours with a minimum respite period between blocks of one (1) hour.
- Low-pitch tonal beepers should be installed where possible and reversing minimised on site.
- All engine covers are to be closed and machines that are not in use, shut down.
- Where possible, high noise generating activities such as loading and unloading and material dumps should be located as far as possible from the nearest receptors, except by prior arrangement.
- Works should be timed to avoid prime breeding season (Spring) for the majority of native species residing in the area which may be sensitive to noise and vibration during breeding and fledging.

Operation

No further Safeguards were considered necessary for the operational phase of the Proposal. Operation of bridges following installation is not likely to result in any additional ongoing noise impacts.

Environmental Safeguards – Air Quality

Construction

- Council must undertake community engagement and liaison, to set expectations for the works schedule and likely impacts arising as part of the works, particularly prior to works commencing.
- Daily visual construction dust monitoring should occur, with works to cease if dust plumes are occurring that have potential to impact areas outside the direct impact footprint.
- Drivers must adhere to speed limits on access tracks, the proposed diversion route across Crown Creek and across the sites in general during dry weather to keep dust to a minimum.
- Provide an adequate water supply on the construction site for effective dust/particulate matter suppression/mitigation. If synthetic dust suppressants are used, they must be biodegradable in nature and non-toxic for waterways.
- Earthworks and exposed areas/soil stockpiles are to be revegetated using appropriate native/crop species to stabilise surfaces as soon as practicable.
- Only vegetation that has been approved for removal may be removed or otherwise impacted; intact vegetation stabilises soils and keeps dust to a minimum.
- Vegetation and other materials are not to be burnt on site, unless the vegetation material is a weed that prohibits transportation and disposal by other means.
- Vehicles transporting waste or other materials that may produce odours or dust are to be covered during transit.
- Tracking of machinery carrying soil/spoil through Capertee or Glen Davis is to be avoided where possible.
- Stockpiles or areas that may generate dust are to be managed to suppress dust emissions.
- Dampening of exposed soils will be undertaken during weather conditions conducive to visible dust formation.
- Construction plant and equipment will be maintained in a good working condition in order to limit impacts on air quality through vehicle emissions.
- Fuel operated plant and equipment will not be left idle when not in use.
- Regular site inspections will be undertaken as part of air quality monitoring, and inspection results recorded by Council's Principal Contractor.
- Any dust complaints received during construction will be duly investigated in accordance with Council's requirements under the POEO Act.
- Any exceptional incidents that cause dust and/or air emissions, either on or off site, will be recorded, and the action taken to resolve the situation recorded in the logbook.

Operation

- Continue to undertake a air quality and quantity monitoring program in line with Council's requirements until all sites are completely stabilised; monitoring should include details of proposed baseline and air quality following any extended dry periods.

- Subject site rehabilitation, including removal of weeds and revegetation using appropriate native species, to be undertaken to ensure soil stability and prevention of dust generation from the site into the future. Revegetation must be maintained with a survival rate of >80%.

Environmental Safeguards – Non-Aboriginal Heritage

- If archaeological remains or items defined as relics under the NSW Heritage Act 1977 are uncovered during the works, all works must cease in the vicinity of the material/find and Council's Manager Strategic Planning and Environmental Officer and Project Officer are to be contacted immediately.
- Council's workers and all staff must be made aware of any heritage sites and places that occur within the area and all care must be taken to avoid interference with and damage to these sites.
- Heritage sites must be clearly fenced/flagged with removable flagging or other temporary means to delineate their presence and in order to prevent them being harmed during the construction process.

Environmental Safeguards – Aboriginal Heritage

- All staff and visitors should be inducted to site to ensure they are aware of the possible presence of sensitive Aboriginal heritage items located within the vicinity of the work site, and the protective measures that should remain in place throughout the works.
- Should unanticipated archaeological material be encountered during site works, all work must cease, and an archaeologist contacted to make an assessment of the find. Further archaeological assessment and Aboriginal community consultation may be required prior to the recommencement of works. Any objects confirmed to be Aboriginal in origin must be reported to Heritage NSW.
- If sub-surface Aboriginal heritage items are uncovered during the works, all works in the vicinity of the find must cease and the Council's Manager Strategic Planning and Manager Environment or an archaeologist are to be contacted immediately. Works in the vicinity of the find must not re-commence until clearance has been received from those Council officers and the NSW Office of Environment & Heritage. Further archaeological assessment and Aboriginal community consultation may be required prior to the recommencement of works.
- The site along the proposed diversion route at Airly Creek is the responsibility of Council. TEF/Apex have not undertaken investigations or assessment along the diversion route. LL has stated that appropriate mitigation measures, including fencing, will be undertaken to protect the site from any potential damage.

Environmental Safeguards – Biodiversity

Timing of Clearing (terrestrial and aquatic)

- Where practicable, it is recommended to time the works outside of key bird and frog breeding seasons to avoid nest abandonment, breeding disruption, injury or death to native fauna. The works are proposed to occur in the winter of 2022, which falls outside of the breeding season

for frog species of concern and also avoids the breeding season of most birds. Some owls breed within late winter, however no large tree hollows suitable for nesting owls will be directly impacted by the works and works are to take place during daylight hours.

Vegetation Removal

- Clearly delineate vegetation to be removed/retained with the assistance of an ecologist, or similarly qualified professional, and induct all site personnel as to the approved extent of clearing. Ensure that no clearing of vegetation occurs outside of the marked boundary.
- Where any trees requiring removal contain hollows, nests or other signs of occupation, a staged clearing approach must be undertaken where hollow limbs are removed carefully and incrementally by a qualified tree surgeon/arborist. Care should be taken to inspect limbs for fauna prior to their removal.
- Prior to clearing, a preclearance survey should be undertaken including inspection of hollows to confirm occupation by fauna. Care should be taken to identify nests and/or roosting sites. If fauna habitat is present (nests or potential tree hollows) the Council or Council's appointed contractor would contact the project ecologist for further advice prior to clearing.
- Ensure the presence of an ecologist or fauna spotter catcher at all times during pre-clearing and clearing activities (including instream) to remove and relocate wildlife as necessary, and to attend to any wildlife that are injured as a result of works.
- All tree hollows removed are to be replaced with artificial hollows (nest boxes or augmented hollows) at a rate of 2:1. The size of nest box entrances is to be suited to the requirements of the threatened species that occupy the area/matched to those that have been removed. Nest boxes should be erected near the habitat to be removed in a suitable position prior to the commencement of vegetation clearing works. The project ecologist should be consulted to determine appropriate size and number to be erected.
- Felled trees or existing logs must be placed strategically and in proximity to the work site to provide refuge and potential habitat in the understorey whilst ensuring no further damage to surrounding vegetation. Placement of logs and felled trees will also aid in the regeneration of the area.
- Where additional vegetation removal is proposed this must first be assessed to consider the cumulative impacts against the approved clearance footprint, and if appropriate supervised by a qualified ecologist and Council's Environmental Officer.

Habitat Protection - terrestrial

- Clearly delineate vegetation to be removed/retained with the assistance of an ecologist, or similarly qualified professional, and induct all site personnel as to the approved extent of clearing. Ensure that no clearing of vegetation occurs outside of the marked boundary.
- The presence of a suitably qualified arborist is recommended during earthworks occurring near retained trees to avoid rootzones impacts.
- Ensure all work crew understand the importance of habitat features onsite including rocky outcrops, pools, stags, fallen timber and logs. Avoid impact to all habitat within the subject site wherever possible.
- All bridges are to be inspected for roosting bats/ birds and other fauna prior to works commencing and at the start of each workday.

Habitat Protection - aquatic

- Pools are to be checked for any signs of frogs, tadpoles, fish and any other aquatic life prior to works commencing.
- Divert waterflows around the site when working within streambeds for all bridges, ensuring water movement is maintained along the creeks at all times. If a dry works area is required, flow diversion pumping may be required.
- All snags, boulders and woody debris are to remain in place where possible.
- Multiple stage Erosion and Sediment Controls (ERSED) are to be installed and maintained throughout the construction phase of the project and removed once all areas are stabilised.
- Downstream monitoring of water quality using turbidity parameters (to be detailed in the CEMP) is to occur prior to and during construction works. No downstream siltation is to occur, and only clean water is to leave the site to ensure protection of downstream aquatic habitats.
- Any weeds or species of concern are to be removed from the subject sites and Council is to be notified

Rehabilitation

- Revegetation activities will be undertaken using native species sourced from local seed wherever possible. Areas to be re-seeded may be marked in the CEMP as a record of rehabilitation efforts made. Vegetation cover should be returned to the site within a reasonably practicable timeframe post clearing to reduce soil exposure and loss.
- Stream banks should be reinstated as near as practicable to their original profile. Where required, geofabric, which remains permeable to water and enhances plant growth, should be used to stabilise soil and sediment during re-establishment.

General

- Vehicles and machinery (including cranes) to work from the sealed road wherever possible and not to extend beyond the direct impact footprint.
 - Ensure vehicles and machinery are cleaned and checked for any traces of weeds, seeds and mud prior to entering work site.
 - All soils to be stockpiled at designated stockpile locations in a cleared area, within pre-approved zones.
 - Appropriate erosion and sediment migration reduction/control measures should be in place.
 - Heavy vehicles are not to be parked under tree drip lines/ leaf canopy to avoid compaction of soil, which is damaging to mature native trees and can cause dieback or tree mortality.
 - All machinery and vehicles are to be clean and inspected prior to arriving on-site to reduce the spread of weeds and disease (e.g., *Phytophthora cinnamomi*) to the site.
 - Strict hygiene protocols must be followed to ensure that no environmental weeds spread around during works or are introduced to site as a result of the proposed works. If weeds are accidentally transported to site, or identified during construction activities, all weed material should be immediately contained and removed from site.
 - Locate stockpile sites away from waterways, drainage lines and native vegetation. Ensure these are appropriately stabilized in accordance with the 'Blue Book' (Landcom 2004).
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- Declared weeds must be managed according to requirements under the Biosecurity Act 2015. It is recommended that all Weeds of National Significance should be managed to ensure they do not spread, and where possible eradicated.

Environmental Safeguards – Traffic and Transport

Construction

- Consider the location of designated parking areas, stockpile locations, construction laydown sites, site offices, and access routes carefully in consideration of creating inconveniences to local residents, and to the other environmental constraints.
- Works are to minimise impacts to residents/landholders by very careful planning of the timing of road closures and effective communication with residents and other road users.
- All road signs and marking will be in accordance with the RMS Guide to Signs and Markings; Australian Standards AS1742 and AS1743; and the Australian Roads Guide to Traffic Management.
- Traffic and transport complaints are to be monitored and addressed promptly where practicable.
- Council is to liaise with Centennial Coal (CC) to ensure the proposed traffic diversion for the Airly Creek site is appropriately managed and all safety measures are adhered to. TEF has not assessed the diversion and responsibility remains with Council to ensure all planning, safety, access and traffic control measures are adhered to.

Operation

Routine maintenance checks should be completed on each bridge to ensure ongoing road user safety.

Environmental Safeguards – Socio-economic considerations

- Considerate construction practices are to be implemented at all times during works, including the construction site is to be left in a clean and tidy manner at the end of each workday, and noise, air quality and visual amenity impacts are to be kept to a minimum.
 - All materials purchased for the Proposal are to be of highest quality and most sustainable as possible, to reduce impacts to community and ratepayers through replacement of low-quality or faulty equipment in the future.
 - Quality assurance is to be applied to all aspects of the Proposal, including design and construction to ensure best value for the local community.
 - Disruption of traffic is to be minimised wherever possible and clear communication and planning between construction crew and landowners is to be undertaken.
 - Community engagement is to be undertaken to obtain feedback on concerns, and address issues as they arise.
 - Construction machinery and work vehicles to be discretely parked when not in use to reduce visual impact and ensure safe pullover is available where possible.
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Environmental Safeguards – Waste and Resource Use

- All wastes generated as part of this Proposal will be managed in accordance with the *Protection of the Environment Operations Act 1997*, and EPA and Council guidelines.
- Resource management hierarchy principles are to be followed; namely, the avoidance, reduction, reuse and recycling of resources.
- If stockpile or laydown sites for excess construction materials, spoil or other wastes are required in locations that have not been considered as occurring within the impact footprint as part of this REF, additional approval will need to be sought prior to any clearing taking place.
- Requirements under the Landcom (2004) stockpile management procedure must be observed, including correct placement of earth banks (with sedimentation ponds) to divert water around stockpiles if placed on a slope, and/or filter fences erected below stockpiles to capture any sediment moving offsite.
- Bulk project waste (e.g., clean virgin excavated natural material or clean fill) sent to a site not owned by Council (excluding DPIE licensed landfills) for land disposal is to have prior formal written approval from the landowner.
- Waste is not to be burnt on site and all general waste will be contained and disposed of at suitable waste facilities.
- Where possible, materials with recycled content will be sourced, and minimum quantities ordered to reduce wastage.
- If contamination is encountered during construction, a site assessment must be undertaken in accordance with the *Protection of the Environment Operations Act 1997* (POEO Act).
- Toilets will be provided for construction workers for the duration of the works to prevent human wastes entering the waterway.
- Waste management for construction projects should be undertaken in accordance with the *NSW Waste Avoidance and Resource Recovery Act 2001*. The objectives of the Act are:
 - To encourage the most efficient use of resources and to reduce environmental harm in accordance with the principles of Ecologically Sustainable Development (ESD),
 - To ensure that resource management options are considered against a hierarchy of the following order: Avoidance of unnecessary resource consumption, Resource recovery (including reuse, reprocessing, recycling and energy recovery), Disposal.
 - To provide for the continual reduction in waste generation,
 - To minimize the consumption of natural resources and the final disposal of waste by encouraging the avoidance of waste and the reuse and recycling of waste,
 - To ensure that industry shares with the community the responsibility for reducing and dealing with waste,
 - To ensure the efficient funding of waste and resource management planning, programs and service delivery,
 - To achieve integrated waste and resource management planning, programs and service delivery on a State-wide basis,
 - To assist in the achievement of the objectives of the *Protection of the Environment Operations Act 1997*.
- Don't over-order.

Environmental Safeguards – Visual amenity

- Considerate construction practices are to be implemented at all times, to ensure the works areas are neat and visually not offensive, including to be kept free from rubbish, and stockpile sites actively managed.
- Vehicles are to be parked in designated areas only.
- No additional, unauthorized clearing or destruction of vegetation is to occur.
- Cleared, bare patches of ground that form part of the works are to be revegetated and restored following cessation of works.
- Obvious and intrusive signs/machinery/equipment are to be removed from the site at the first opportunity.
- Any complaints received regarding visual amenity at the site are to be dealt with and rectified as soon as possible.

Environmental Safeguards – Climate Change

Construction

- Resource management hierarchy principles are to be followed:
 - Avoid unnecessary resource consumption as a priority,
 - Avoidance is followed by resource recovery (including reuse of materials, reprocessing, recycling and energy recovery),
 - Disposal is undertaken as a last resort (in accordance with the *Waste Avoidance & Resource Recovery Act 2001*).
- Quality assurance and life cycle of materials are to be considered when purchasing, to ensure the newly built infrastructure is resilient and structurally sound.
- Local resources and labour are to be used wherever possible, to reduce waste and emissions, and increase efficiencies.

Operation

- Regular maintenance of structure to reduce degradation and increase lifespan.
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